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MONTHLY WEATHER REVIEW

JUNE 1949

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THE TENTATIVE NORMAL DIURNAL HEIGHT CHANGE OF THE 700-MILLIBAR SURFACE OVER THE UNITED STATES AND ADJACENT AREAS

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Manuscript received April 2, 1949

INTRODUCTION

In the course of constructing prognostic 700-millibar contour charts, there is a need for information concerning the normal diurnal height change of that surface during the 12 hours between the two daily radiosonde observations. The observed height changes are corrected by subtracting the diurnal height change. The heights forecast on a 12- or 36-hour prognostic chart also should be corrected by adding the diurnal height change. This need for values of the normal diurnal height change is particularly great in working with comparatively weak summer weather patterns where for a given 12-hour period the diurnal height change is an appreciable percentage of the height change associated with the movement of weather systems.

To fill the need, computation of the normals was undertaken. Limitations in data prevented basing computations on a long record; in fact, valid data were available for only 2 years. Nevertheless, by applying smoothing techniques to those 2 years of data, it was possible to obtain tentative normals approximating long period averages.

The results of the computations are presented here in 12 monthly charts of the tentative normal 700-mb. height change from 0300 GMT to 1500 GMT, in feet per 12 hours. Diurnal 700-mb. height change charts similar to these have been utilized by Weather Bureau-Air Force-Navy Analysis Center personnel since early in 1948. The accuracy of the tentative normals has been found adequate for routine prognostication work. This fact justifies publishing the charts to satisfy immediate demands for quantitative information about the diurnal variation in height of the 700-mb. surface. The charts are intended to serve until the time when accurate data are available for a long enough period (perhaps 10 years) to permit construction of a permanent set of charts.

To emphasize the tentative nature of the charts and to caution against their indiscriminate use, the following paragraphs describe the limitations of the data, the methods of computing the normals, and some of the factors influencing their reliability.

DATA LIMITATIONS

As already mentioned, limitations in data prevented computing long period averages. Although twice-daily radiosonde observations have been available for the United States since 1941, much of the record could not be used because of errors in computed heights of pressure surfaces resulting from errors in the temperatures transmitted by the radiosonde instrument. In particular, for daytime radiosonde flights, computed heights are too high if the temperature measuring element is warmed appreciably by solar radiation. Thus, diurnal height changes computed from such data are in error by the value of the *virtual* diurnal height changes, that is, that part of the diurnal height change resulting from the difference between the radiational temperature errors for the two times of observation.

Although radiosondes with negligible radiational temperature errors have been used in the United States for several years, few stations used these instruments exclusively before January 1947. For this reason, it was undesirable in this investigation to use data for previous years and only the data for the 2-year period January 1947 through December 1948 were used.

As a direct step toward computing the normal diurnal values, an attempt involving a great amount of labor was made to use original station radiosonde records. However, monthly means of such records were biased toward high values unless recomputed after individual daily values, missing as a result of bad weather (and therefore generally low values) had been estimated. In addition, longer breaks in station records resulting from equipment shortages and other causes were found to be very difficult to handle. For these reasons, it was necessary to look elsewhere for suitable twice-daily values of the heights of the 700-mb. surface.

The data for the period January 1947 through December 1948 found suitable for processing were the heights of the 700-mb. surface taken at selected latitude and longitude intersections from maps analyzed twice daily by the Extended Forecast Section of the Weather Bureau. The grid of selected points consisted of intersections for every

5 degrees of latitude and longitude over and near the United States and intersections for every 5 degrees of latitude and alternating 10-degree intervals of longitude elsewhere. These data recorded on punched cards were made available by the Machine Tabulation Unit of the Weather Bureau.

For areas adjacent to the continental limits of the United States, the analyses from which the diurnal values are derived, are based in part on sparse, irregular data and on heights extrapolated from surface data. However, there is sufficient consistency in the diurnals computed over these areas to justify including them in the charts published here. But, to indicate that the reliability of the diurnals over these areas is not on a par with those over the United States, the isopleths are dashed.

COMPUTING THE MONTHLY MEAN VALUES

After the selection of data for processing, the next step was to compute the monthly mean of the diurnal height change for each intersection described in the preceding section. The 12-hour diurnal height change at a point was found by averaging two 0300 GMT 700-mb. height values at 24-hour intervals and subtracting this average 0300 GMT height from the height of the surface given by the intermediate 1500 GMT analysis. Then, the monthly mean of the 12-hour changes was determined by the formula:

$$\frac{\Sigma h}{n}-\frac{2\Sigma H-H_e+H_f}{2n} \text{ or } \frac{\Sigma h-\Sigma H}{n}+\frac{H_e-H_f}{2n}$$

where Σh=the monthly sum of the daily 1500 GMT 700-mb. heights,
ΣH=the monthly sum of the daily 0300 GMT 700-mb. heights,
H_e=the height of the 700-mb. surface at 0300 GMT on the first day of the current month,
H_f=the height of the 700-mb. surface at 0300 GMT on the first day of the following month,
n=the number of days in the current month.

The term $\frac{\Sigma h-\Sigma H}{n}$ is the monthly mean difference between the twice daily observations. The remaining expression, $\frac{H_e-H_f}{2n}$ is a correction term which tends to eliminate the seasonal trend of the height of the 700-mb. surface and also the effect of any nonseasonal variation from generally low values over a particular area at the beginning of a month to generally high values at the end of the month, or high values at the beginning and low at the end. The averaging process must be depended on to minimize the effect of nonrepresentative values of the diurnal height change which occur with the passage of weather systems.

For use in determining the monthly means, monthly values of the quantity $2\Sigma h-2\Sigma H+H_e-H_f$ for the period January 1947 through December 1948 were computed by the Machine Tabulation Unit. Division of these monthly data by 2n gave the monthly mean-diurnal height difference between the 12-hourly observations.

The field of mean values obtained was somewhat irregular in certain parts of the country and to a larger extent outside the United States where 700-mb. analyses were based on data from widely scattered stations. Doubtless these irregularities came about because the period covered by the data is a short one on which to base normal values. In contrast to this short period, for example, a 10-year record was used in computing the normal surface diurnal pressure change for the United States [1]. To eliminate these irregularities, a smoothing process now to be described was used.

SMOOTHING THE MONTHLY MEAN VALUES

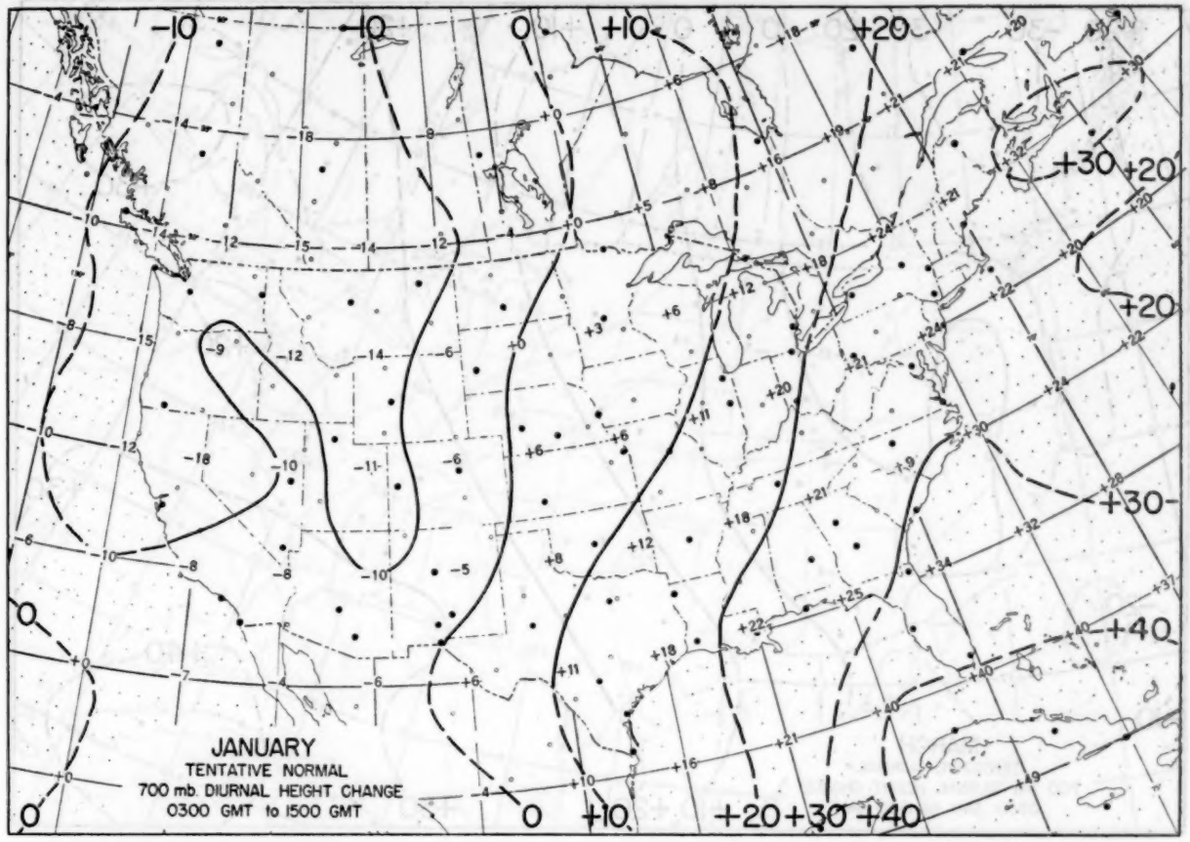
In the smoothing process, it was necessary to plot a separate graph of the monthly mean values for each latitude and longitude intersection. The abscissa of the graph is the month of the year and the ordinate, the value of the monthly mean diurnal height change. At intersections where irregularities made it necessary, curves smoothing the month-to-month trend of the diurnal change were drawn on these graphs to satisfy the plotted data as well as possible but at the same time to account for the similarity each curve should have to curves at neighboring intersections, and for the regularity of month-to-month variation that would be compatible with factors causing the variation.

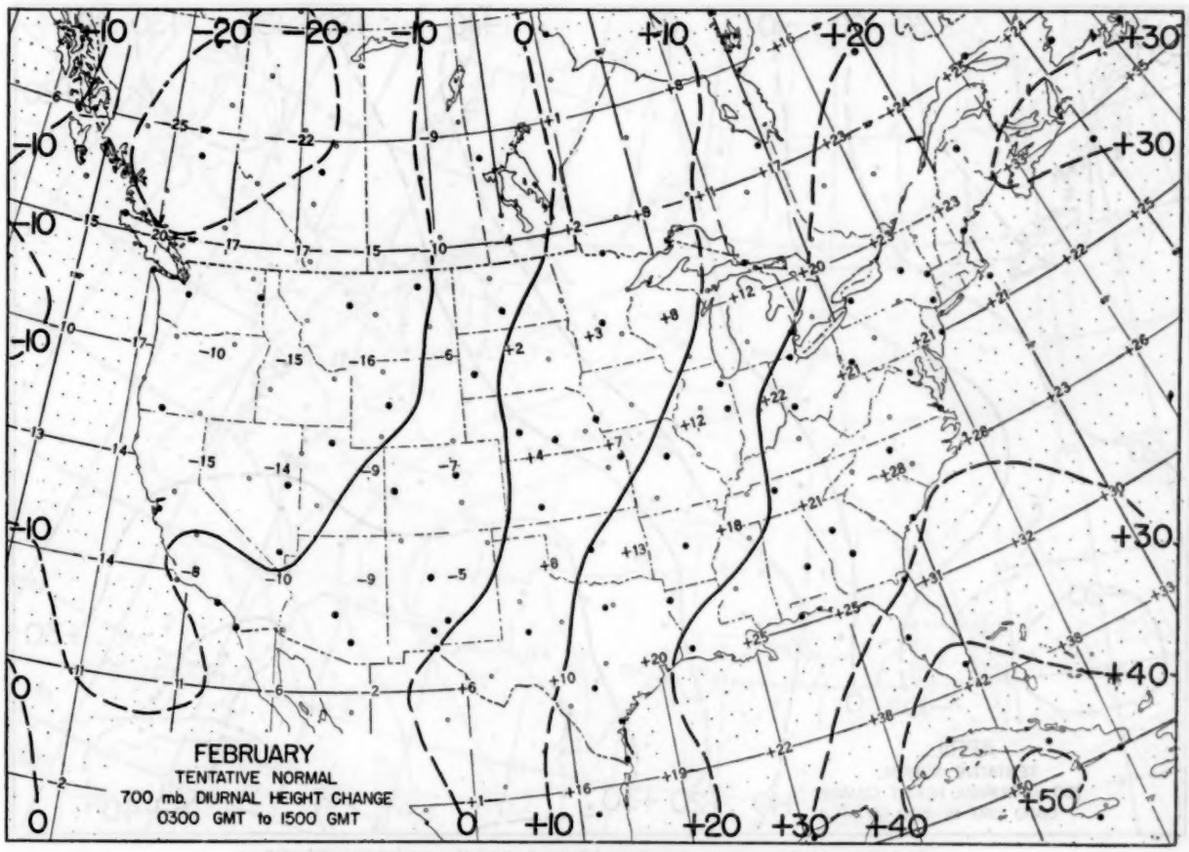
The graphical smoothing process used is equivalent to averaging monthly values for three consecutive months to get the normal value for the intermediate month by means of the smoothing formula; $b_n=\frac{a+2b+c}{4}$, where b_n is the normal being computed and a, b, and c are monthly mean values for the preceding, current and succeeding months, respectively. The process has the effect of increasing the length of the record. Monthly values of the diurnal variation taken from the smoothed curves are the tentative normals presented in the charts published here.

THE CHARTS OF TENTATIVE NORMALS

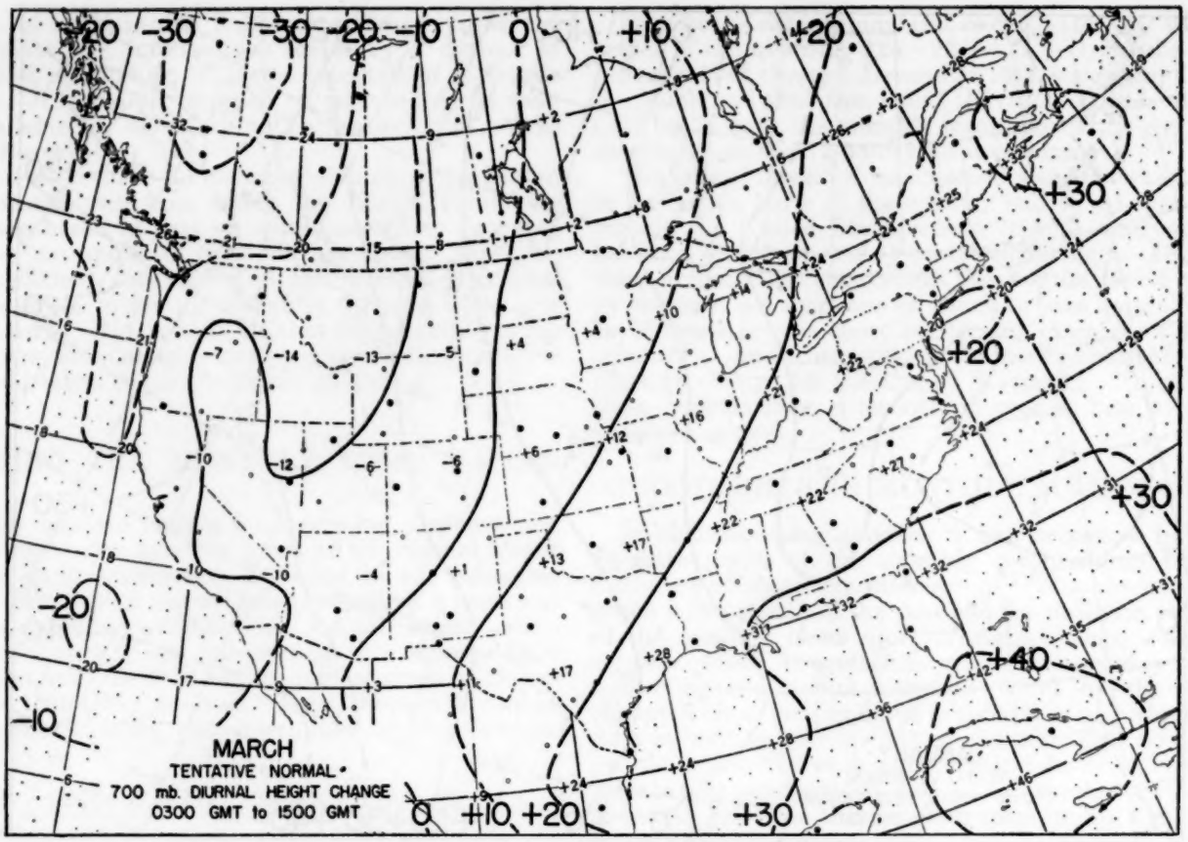
On the 12 monthly charts, there is plotted for each latitude-longitude intersection for which data were available, the tentative normal diurnal change in height of the 700-mb. surface from 0300 GMT to 1500 GMT. The units are feet per 12 hours. In addition, isopleths are drawn for 10-foot intervals. The dashed isopleths in areas outside the United States indicate less reliable values resulting from irregularity or sparsity of observations. The tentative normal diurnal height change from 1500 GMT to 0300 GMT can be taken from these charts by reversing the sign of the change.

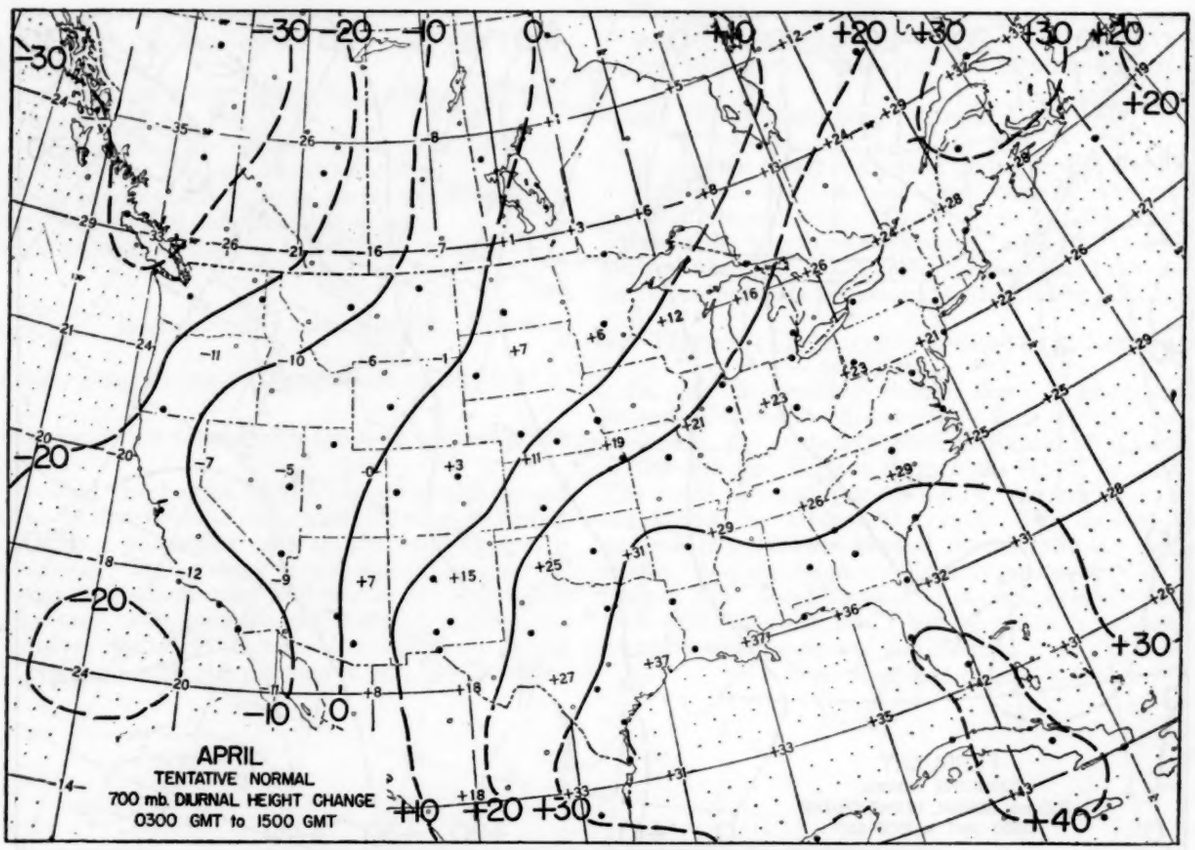
(Text continued on page 175)



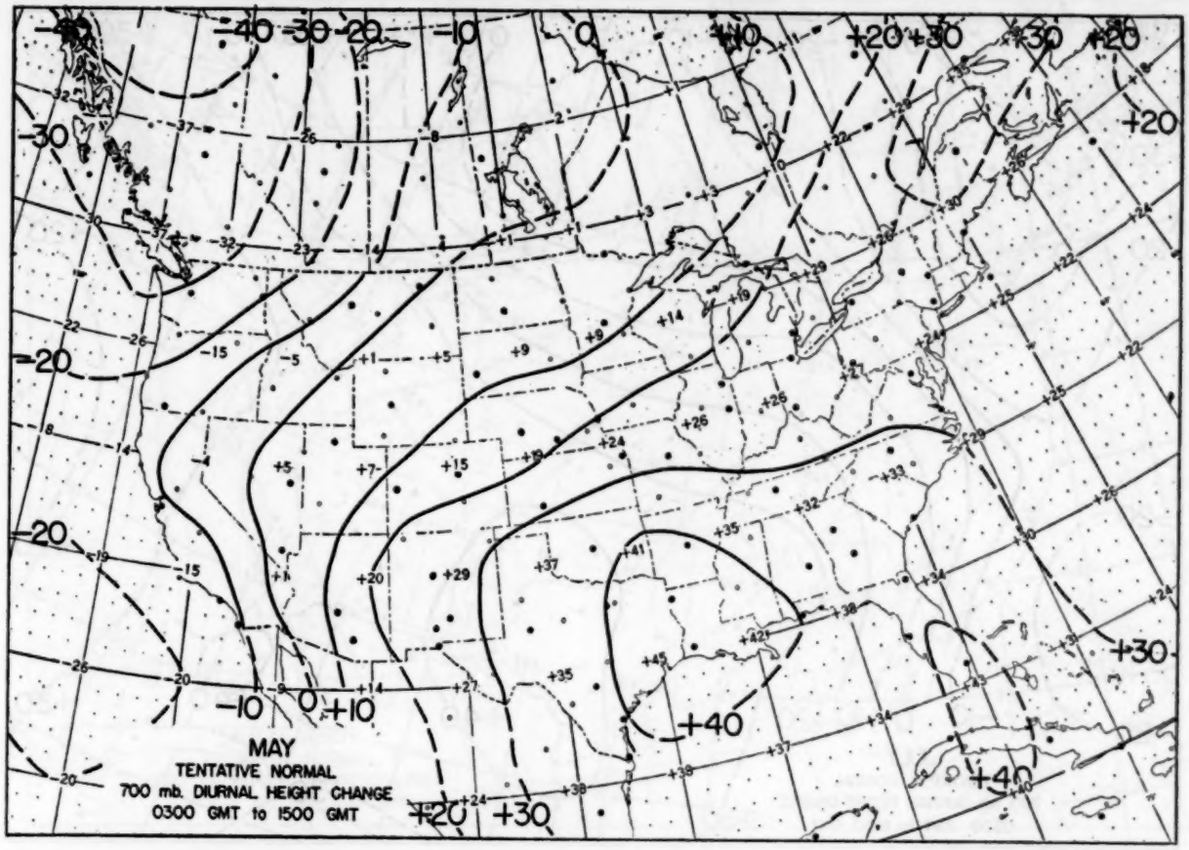


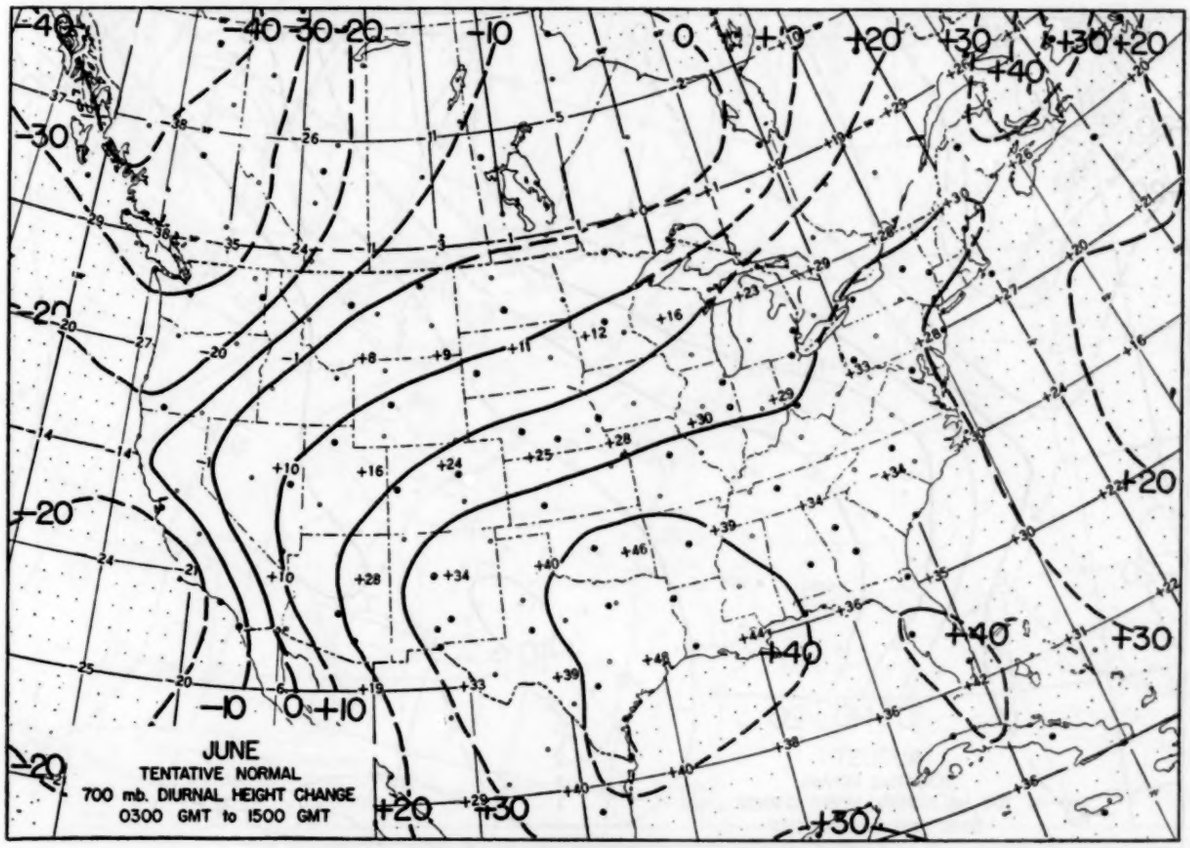
Dashed lines outside the limits of the United States show relative unreliability of the data.
To obtain the normal change for the period 1500 GMT to 0300 GMT, simply reverse the sign.
Based on data for 1947 and 1948.



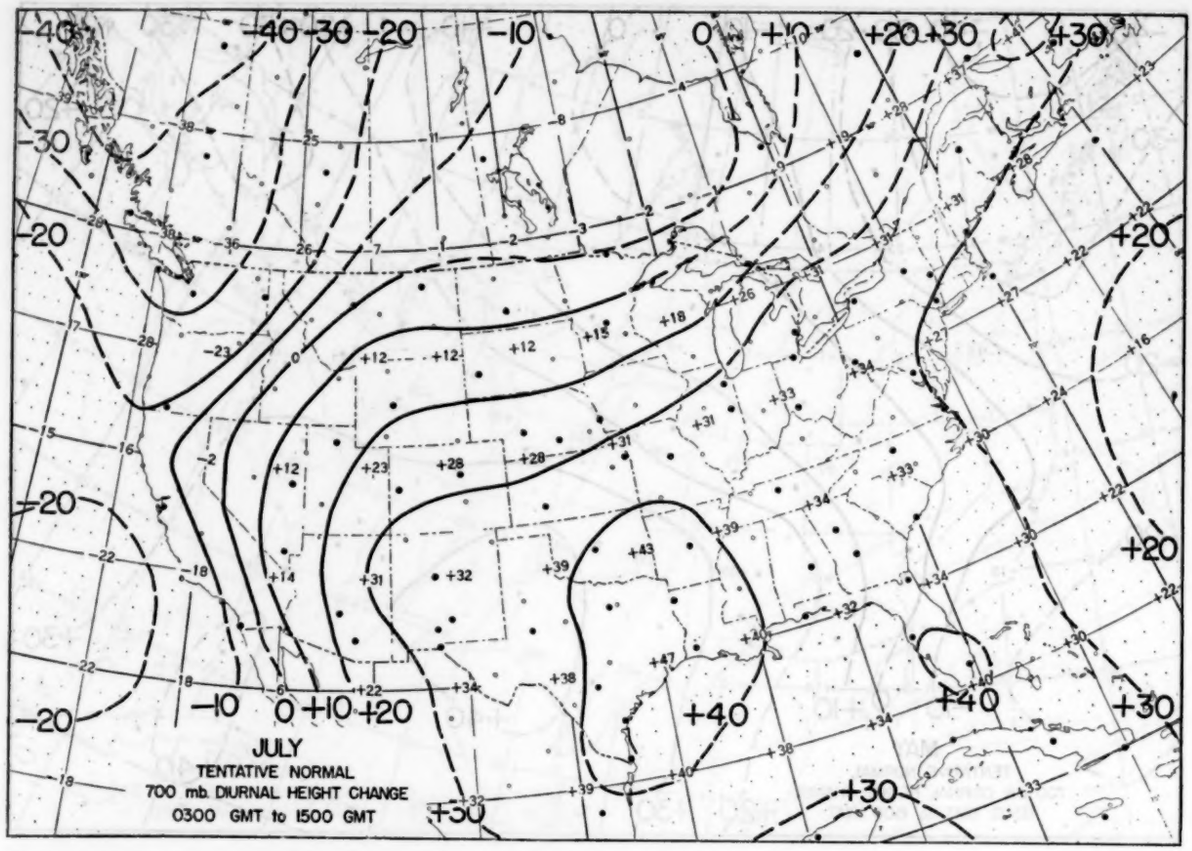


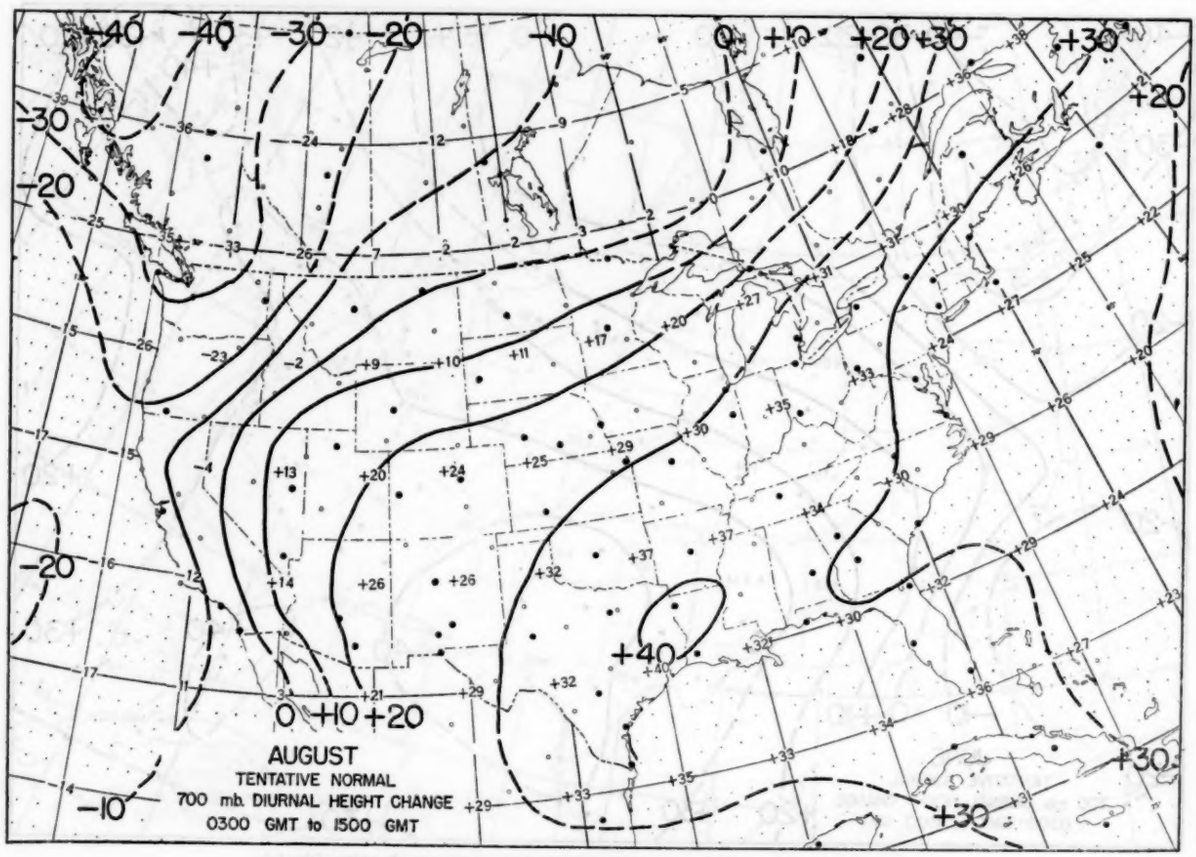
Dashed lines outside the limits of the United States show relative unreliability of the data. To obtain the normal change for the period 1500 GMT to 0300 GMT, simply reverse the sign. Based on data for 1947 and 1948.



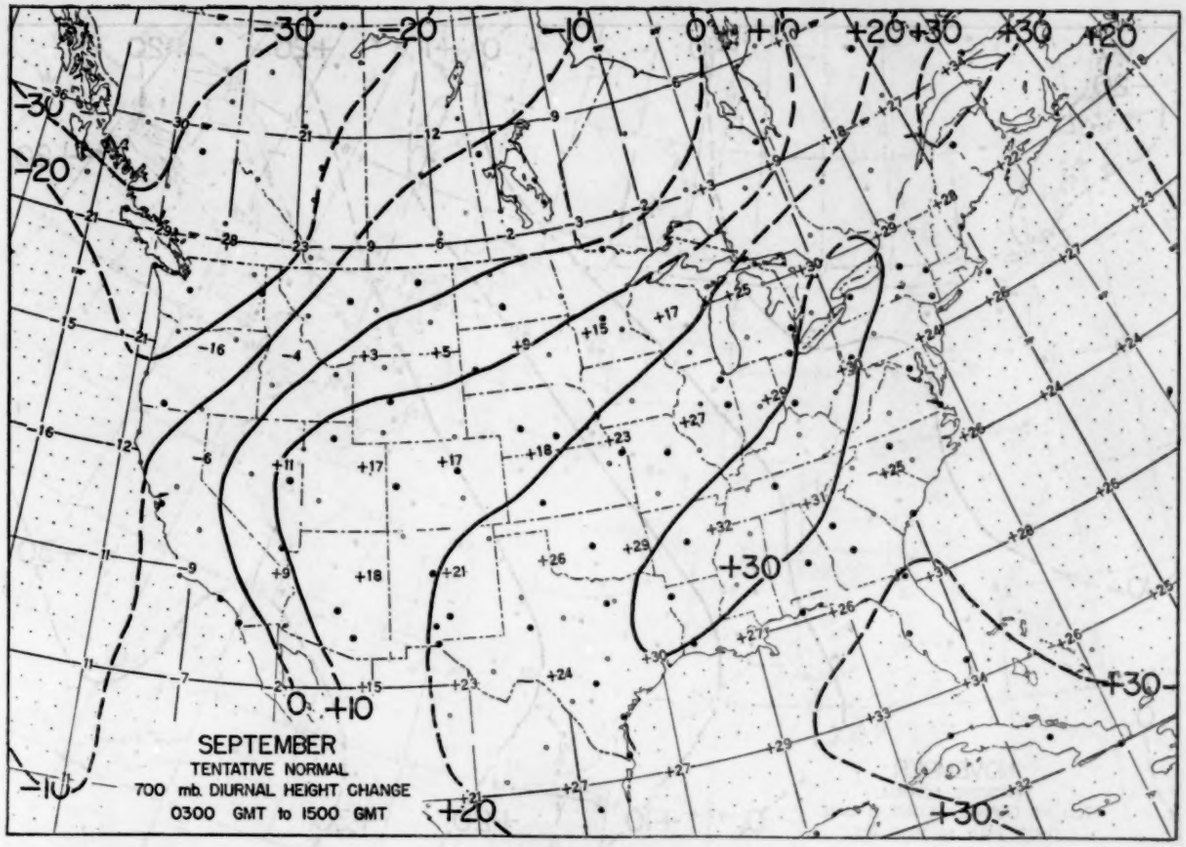


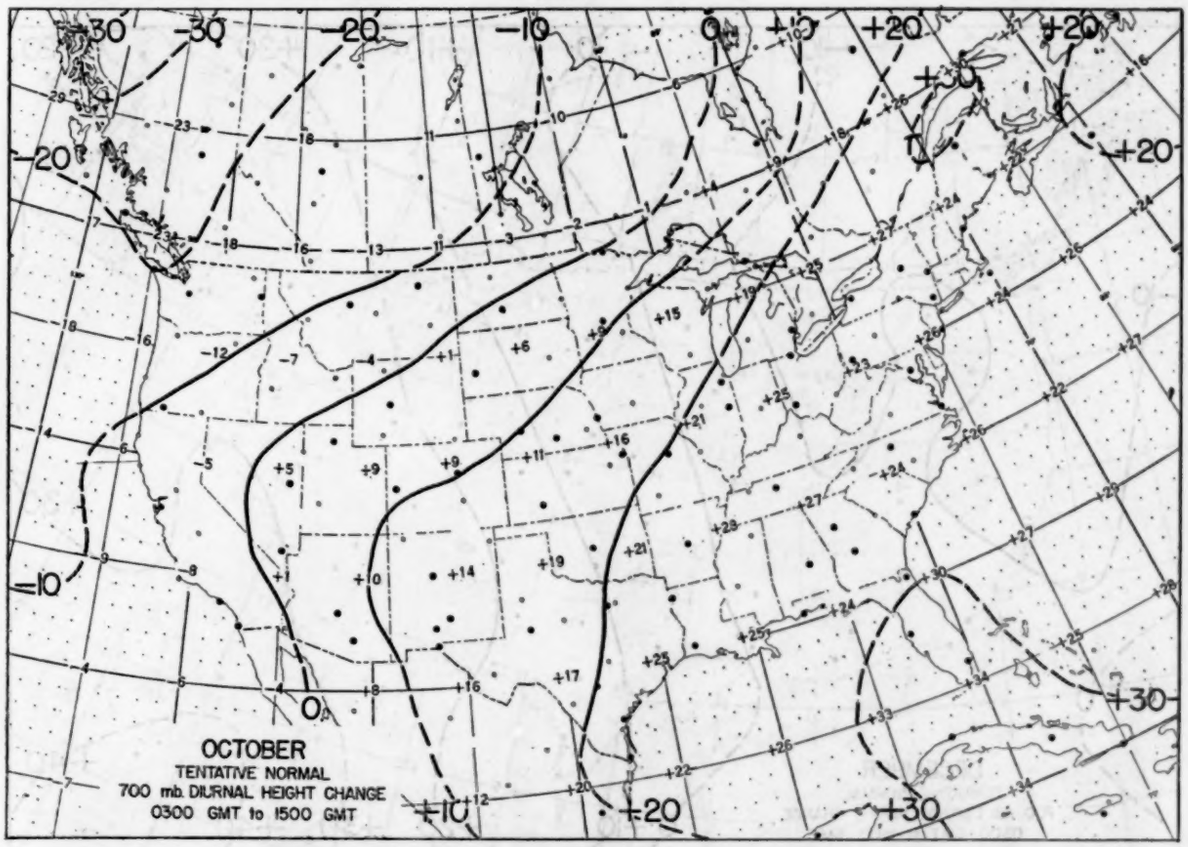
Dashed lines outside the limits of the United States show relative unreliability of the data. To obtain the normal change for the period 1500 GMT to 0300 GMT, simply reverse the sign. Based on data for 1947 and 1948.





Dashed lines outside the limits of the United States show relative unreliability of the data. To obtain the normal change for the period 1500 GMT to 0300 GMT, simply reverse the sign. Based on data for 1947 and 1948.





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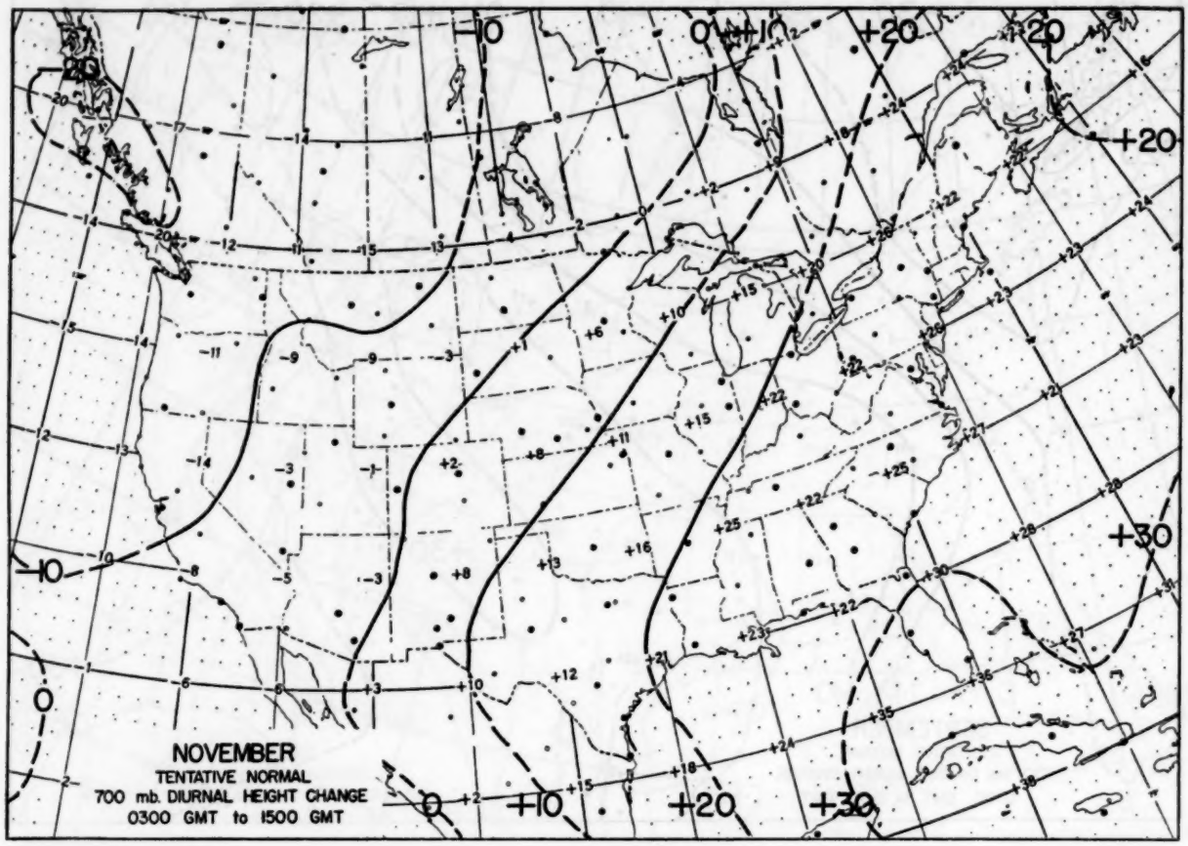

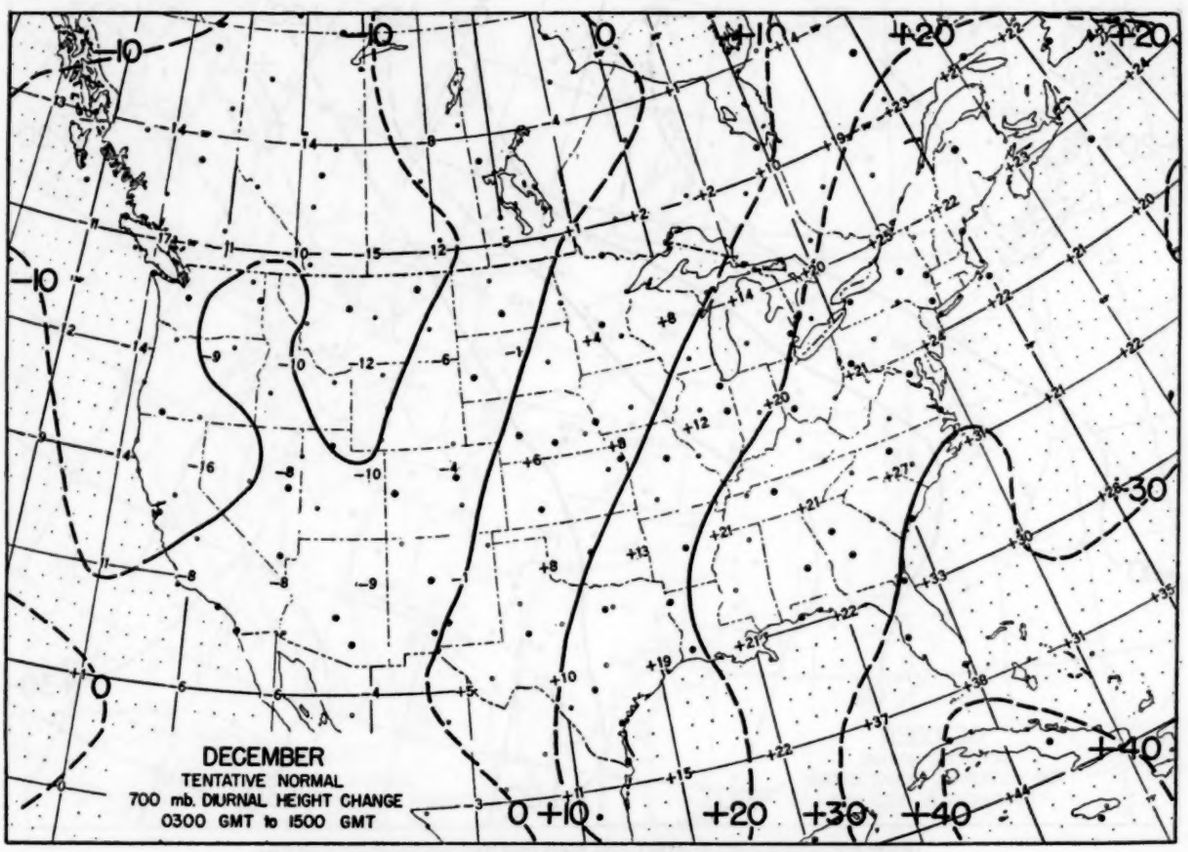

Dashed lines outside the limits of the United States show relative unreliability of the data. To obtain the normal change for the period 1500 GMT to 0300 GMT, simply reverse the sign. Based on data for 1947 and 1948.

RELIABILITY OF THE CHARTS

In the description of the computation of the tentative normals, factors affecting the reliability of the results and methods used to minimize these effects were discussed. Though the final results are considered to give good estimates of normals based on long period averages, it would be worthwhile for users of the charts to keep in mind these limitations.

The largest source of variability in the month to month values results from large magnitude height changes of the constant pressure surface as systems with strong contour gradients move rapidly across the map. This kind of variability would be eliminated by a climatological record of great length. Some of the diurnal values presented here may prove to be in error by as much as 10 feet per 12 hours. This estimate is based on the amount of smoothing of data that was necessary. A thoroughly reliable set of diurnal height change charts is impossible until there is available for all radiosonde stations a long-period record of observations made with instruments free of radiational temperature errors.

DEPARTURES FROM NORMAL

In addition to limitations resulting from the short period of record, departures from normal associated with anomalous weather conditions should be considered when the charts are used in synoptic work. The diurnal height change for any given day will differ from the normal value depending on fluctuations in cloudiness, humidity, and wind, and possibly with variations in solar radiation, thickness of the ozone layer, tidal effects, etc. The probable magnitude of the anomaly is suggested by variations in diurnal pressure tendencies at surface stations. Over inland areas, the surface diurnal pressure change will often double its normal value in an area temporarily under the influence of a high pressure center, especially if subsidence is pronounced, skies clear, and humidities very low. Large anomalies in the surface diurnal pressure change are associated with large anomalies in the diurnal temperature range. The anomaly is, then, largely a low level phenomenon and will become smaller with distance above the ground. At 700 millibars, the anomaly should be of greater significance over the higher ground of the western States. O. R. Wulf [2] has observed diurnal tendencies near the 300-mb. level to be larger than normal in the vicinity of a ridge and smaller in the vicinity of a trough. Further experience with the charts presented here should indicate the extent to which such relations hold at the 700-mb. level.

ACKNOWLEDGMENT

The author is indebted to M. H. Frankel of the Weather Bureau Machine Tabulation Unit for preparing summaries of the raw data. L. C. Norton and other members of the WBAN Analysis Center, E. T. Clapp, and Yvonne M. Teweles assisted in processing the data. Valuable technical advice was given by Dr. Mary W. Hodge and C. Harmantas.

SELECTED BIBLIOGRAPHY

1. "Normal Pressures and Tendencies for the United States," *Technical Paper No. 1*, U. S. Weather Bureau, 1943.
2. O. R. Wulf, M. W. Hodge, and S. J. Obloy, "The Meteorological Conditions in the Upper Reaches of the Radiosonde Flights over the United States. II. Diurnal Effects in Temperature and Pressure." *Miscellaneous Reports No. 21*, Department of Meteorology, University of Chicago, 1946.
3. F. N. Cole, "The Diurnal Variation of Barometric Pressure." *Bulletin No. 6*, U. S. Weather Bureau, 1892.
4. H. Riehl, "Diurnal Variation of Pressure and Temperature Aloft in the Eastern Caribbean," *Bulletin of the American Meteorological Society*, vol. 28, No. 7, September 1947, pp. 311–318.

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METEOROLOGICAL AND CLIMATOLOGICAL DATA FOR JUNE 1949

AEROLOGICAL OBSERVATIONS

[For description of change in Table 1 and charts, see REVIEW, January 1946, p. 6]

TABLE 1.—*Mean dynamic height (geopotential) in units of 0.98 dynamic meters, temperature in degrees centigrade, and relative humidity in percent, for standard pressures, as obtained by radiosondes during June 1949*

STATIONS AND MEAN SURFACE PRESSURES

Standard pressure surface (mb.)	Albany, N. Y. (1,005.7 mb.)				Albuquerque, N. Mex. (834.5 mb.)				Atlanta, Ga. (981.8 mb.)				Big Spring, Tex. (923.4 mb.)				Bismarck, N. Dak. (951.4 mb.)				Boise, Idaho (912.6 mb.)				Brownsville, Tex. (1,010.2 mb.)			
	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity
Surface	30	86	19.6	74	30	1,620	23.6	34	30	300	22.8	77	30	774	26.3	54	29	505	18.8	63	30	868	22.8	34	30	6	27.4	83
1,000	30	135	(*)	----	30	10	(*)	----	30	139	(*)	----	30	62	(*)	----	29	71	(*)	----	30	62	(*)	----	30	96	26.7	83
950	30	579	19.5	64	30	480	(*)	----	30	589	22.8	69	30	524	(*)	----	29	519	(*)	----	30	519	(*)	----	30	553	24.0	79
900	30	1,042	16.9	66	30	966	(*)	----	30	1,058	20.3	67	30	1,000	26.0	51	29	982	17.4	52	30	988	22.1	32	30	1,023	22.5	61
850	30	1,527	13.6	66	30	1,467	(*)	----	30	1,550	17.0	70	30	1,501	22.5	54	29	1,468	14.4	52	30	1,481	18.5	31	30	1,519	20.2	52
800	30	2,035	10.5	59	30	1,996	21.9	34	30	2,065	13.7	69	30	2,026	18.6	56	29	1,977	10.8	53	30	1,996	14.1	35	30	2,040	17.4	44
750	30	2,571	7.9	53	30	2,558	17.7	35	30	2,611	10.6	64	30	2,580	15.3	48	29	2,518	7.5	53	30	2,538	9.4	41	30	2,592	14.1	42
700	30	3,136	4.7	49	30	3,136	12.7	40	30	3,179	7.6	55	30	3,158	11.6	43	29	3,078	4.1	52	30	3,104	4.6	44	30	3,167	10.6	42
650	30	3,740	1.6	43	30	3,757	7.4	46	30	3,792	4.0	53	30	3,778	6.9	46	29	3,681	.4	50	30	3,702	−.4	48	30	3,784	6.9	37
600	30	4,379	−1.7	38	30	4,405	1.8	56	30	4,434	.3	51	30	4,425	1.7	51	29	4,315	−3.6	48	30	4,338	−4.8	46	30	4,433	3.0	33
550	30	5,067	−5.7	33	30	5,102	−3.9	63	30	5,125	−3.6	47	28	5,118	−3.3	48	29	4,999	−7.8	43	30	5,018	−8.9	39	29	5,131	−1.5	34
500	30	5,806	−10.1	----	30	5,845	−9.4	65	30	5,874	−8.0	45	28	5,868	−8.2	42	29	5,732	−12.3	38	30	5,749	−13.9	38	29	5,884	−6.5	41
450	30	6,618	−15.3	----	30	6,658	−14.9	59	29	6,694	−13.2	45	28	6,685	−13.6	39	29	6,535	−18.0	37	30	6,548	−19.3	36	29	6,709	−11.6	39
400	30	7,486	−22.0	----	30	7,533	−20.5	----	29	7,574	−18.9	44	28	7,566	−19.5	36	29	7,399	−24.2	----	30	7,407	−25.5	----	29	7,593	−17.7	32
350	30	8,454	−29.3	----	30	8,507	−27.7	----	29	8,554	−26.1	----	28	8,544	−26.5	----	29	8,358	−31.7	----	29	8,359	−32.9	----	29	8,578	−24.8	----
300	30	9,535	−37.7	----	30	9,595	−36.2	----	29	9,650	−34.6	----	28	9,639	−34.6	----	29	9,429	−39.9	----	29	9,426	−40.8	----	28	9,680	−33.1	----
250	30	10,767	−46.8	----	30	10,834	−45.7	----	28	10,900	−44.7	----	28	10,887	−44.0	----	27	10,649	−48.2	----	29	10,642	−49.2	----	26	10,935	−42.4	----
200	30	12,212	−56.7	----	29	12,285	−54.7	----	28	12,354	−56.1	----	28	12,352	−54.1	----	27	12,095	−54.7	----	29	12,086	−54.2	----	25	12,407	−53.3	----
175	30	13,049	−60.4	----	28	13,136	−57.8	----	27	13,194	−61.8	----	28	13,198	−58.8	----	24	12,957	−57.1	----	28	12,934	−55.9	----	24	13,257	−58.8	----
150	28	13,999	−62.0	----	24	14,068	−60.8	----	26	14,137	−66.4	----	25	14,162	−63.4	----	24	13,930	−57.5	----	27	13,912	−56.4	----	22	14,208	−64.5	----
125	23	15,129	−62.9	----	13	15,221	−64.4	----	19	15,249	−68.4	----	21	15,272	−67.5	----	23	15,083	−58.5	----	23	15,061	−57.0	----	21	15,304	−70.8	----
100	21	16,501	−62.3	----	6	16,626	−70.2	----	12	16,528	−68.9	----	15	16,610	−69.7	----	19	16,487	−58.4	----	17	16,465	−57.9	----	12	16,598	−73.2	----
80	12	17,881	−61.0	----	----	----	----	----	5	17,909	−66.2	----	10	17,953	−66.7	----	12	17,883	−57.4	----	9	17,884	−57.4	----	8	17,922	−72.8	----
60	6	19,717	−57.1	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	6	19,709	−55.0	----	----	----	----	----

Standard pressure surface (mb.)	Buffalo, N. Y. (989.3 mb.)				Camaguey, Cuba [1] (------ mb.)				Caribou, Maine (991.5 mb.)				Charleston, S. C. (1,014.0 mb.)				Ciudad Victoria, Mex. (971.6 mb.)				Columbia, Mo. (984.5 mb.)				Dodge City, Kans. (921.6 mb.)			
	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity
Surface	30	221	19.9	70	----	----	----	----	30	191	14.7	81	30	13	22.7	90	27	335	29.7	57	30	239	23.0	81	30	792	22.5	72
1,000	30	127	(*)	----	----	----	----	----	30	117	(*)	----	30	135	23.2	85	27	76	(*)	----	30	102	(*)	----	30	71	(*)	----
950	30	576	20.6	58	----	----	----	----	30	560	15.9	65	30	586	21.7	77	27	539	28.3	55	30	554	23.6	70	30	528	(*)	----
900	30	1,037	17.8	59	----	----	----	----	30	1,013	13.5	64	30	1,052	18.9	76	27	1,013	24.2	59	30	1,023	20.8	71	30	999	23.6	63
850	30	1,524	14.5	57	----	----	----	----	30	1,492	10.4	66	30	1,542	15.9	76	27	1,511	20.2	65	30	1,515	17.8	68	30	1,497	20.7	62
800	30	2,034	11.3	55	----	----	----	----	30	1,994	7.4	67	30	2,055	12.9	73	27	2,032	16.2	69	30	2,032	14.9	62	30	2,019	17.3	62
750	30	2,575	8.5	51	----	----	----	----	30	2,529	4.4	65	30	2,602	10.1	68	27	2,584	12.8	67	30	2,581	11.9	57	30	2,570	13.8	57
700	30	3,138	5.4	51	----	----	----	----	30	3,083	1.1	60	30	3,167	7.0	64	27	3,155	9.5	54	30	3,150	8.5	52	30	3,146	10.0	55
650	30	3,746	2.2	46	----	----	----	----	29	3,682	−1.7	55	30	3,778	3.6	66	26	3,773	5.7	49	30	3,763	4.5	54	30	3,760	5.5	53
600	30	4,384	−1.3	41	----	----	----	----	28	4,310	−5.0	50	30	4,420	.1	62	24	4,417	1.9	48	30	4,408	.6	56	30	4,407	1.0	49
550	28	5,069	−5.0	33	----	----	----	----	28	4,991	−9.2	45	29	5,114	−3.9	58	24	5,117	−2.5	44	30	5,103	−3.5	51	30	5,100	−3.7	47
500	27	5,899	−9.7	----	----	----	----	----	28	5,721	−13.8	43	29	5,859	−8.2	55	24	5,864	−6.8	43	30	5,849	−8.0	47	30	5,848	−8.6	43
450	27	6,616	−15.3	----	----	----	----	----	28	6,516	−19.2	39	29	6,678	−13.5	56	23	6,693	−11.3	46	30	6,669	−13.3	42	30	6,662	−13.9	39
400	26	7,493	−21.3	----	----	----	----	----	28	7,380	−25.2	----	29	7,556	−19.5	54	23	7,577	−16.9	41	30	7,547	−19.2	38	30	7,541	−20.4	37
350	23	8,457	−28.6	----	----	----	----	----	28	8,337	−31.7	----	29	8,534	−26.4	----	23	8,564	−24.1	----	30	8,526	−26.5	----	30	8,514	−27.9	----
300	23	9,542	−36.8	----	----	----	----	----	25	9,409	−39.4	----	29	9,630	−34.8	----	21	9,667	−32.6	----	30	9,620	−35.0	----	30	9,602	−36.1	----
250	22	10,778	−46.0	----	----	----	----	----	25	10,634	−47.5	----	28	10,873	−44.8	----	20	10,924	−43.0	----	30	10,865	−44.9	----	30	10,842	−45.8	----
200	20	12,248	−56.6	----	----	----	----	----	21	12,107	−54.6	----	26	12,323	−56.4	----	18	12,383	−55.3	----	30	12,321	−55.8	----	29	12,300	−55.2	----
175	19	13,103	−61.3	----	----	----	----	----	19	12,945	−56.7	----	26	13,160	−51.8	----	18	13,223	−61.8	----	27	13,153	−60.7	----	28	13,138	−59.8	----
150	16	14,079	−64.6	----	----	----	----	----	14	13,913	−58.3	----	22	14,122	−66.2	----	17	14,160	−68.0	----	24	14,110	−64.1	----	24	14,113	−63.0	----
125	12	15,195	−65.2	----	----	----	----	----	9	15,117	−59.4	----	13	15,216	−68.3	----	10	15,210	−73.3	----	14	15,260	−67.4	----	21	15,231	−65.8	----
100	7	16,555	−64.3	----	----	----	----	----	----	----	----	----	6	16,569	−68.3	----	----	----	----	----	9	16,601	−66.8	----	11	16,596	−67.4	----
80	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	6	17,958	−64.9	----	7	17,963	−65.4	----

Standard pressure surface (mb.)	El Paso, Tex. (877.4 mb.)				Ely, Nev. (807.6 mb.)				Glasgow, Mont. (934.9 mb.)				Grand Junction, Colo. (849.8 mb.)				Great Falls, Mont. (884.1 mb.)				Greensboro, N. C. (984.8 mb.)				Hatteras, N. C. (1,016.1 mb.)			
	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity
Surface	30	1,195	28.9	25	30	1,908	17.1	40	30	648	19.7	47	30	1,474	21.3	37	30	1,128	17.5	46	29	273	21.9	82	30	3	23.5	88
1,000	30	9	(*)	----	30	38	(*)	----	30	60	(*)	----	30	34	(*)	----	30	60	(*)	----	29	139	(*)	----	30	143	22.8	86
950	30	488	(*)	----	30	496	(*)	----	30	513	(*)	----	30	497	(*)	----	30	514	(*)	----	29	589	22.2	71	30	596	20.9	79
900	30	976	(*)	----	30	970	(*)	----	30	975	18.8	40	30	976	(*)	----	30	982	(*)	----	29	1,055	19.4	72	30	1,057	18.2	76
850	30	1,476	27.7	25	30	1,464	(*)	----	30	1,462	14.7	43	30	1,471	(*)	----	30	1,462	15.3	43	29	1,546	16.3	73	30	1,546	15.6	71
800	30	2,008	23.1	28	30	1,988	17.7	35	30	1,971	10.6	49	30	1,997	19.5	35	30	1,973	11.1	46	29	2,060	13.3	72	30	2,059	12.9	66
750	30	2,570	18.2	33	30	2,537	14.2	34	30	2,507	6.2	55	30	2,551	15.1	38	30	2,510	6.6	51	29	2,606	10.1	69	29	2,603	10.1	61
700	30	3,151	13.0	40	30	3,114	9.3	38	30	3,066	2.0	57	30	3,127	10.3	44	30	3,068	1.9	56	29	3,173	6.9	61	29	3,170	7.0	58
650	30	3,768	7.4	48	30	3,723	4.0	44	30	3,661	−2.0	55	30	3,740	5.1	51	30	3,664	−2.9	58	29	3,783	3.9	51	29	3,780	3.7	53
600	30	4,421	1.7	57	30	4,367	−1.4	48	30	4,291	−6.2	51	30	4,385	−.2	57	30	4,290	−7.4	59	29	4,476	.3	49	29	4,422	−.1	49
550	30	5,113	−3.8	58	30	5,052	−7.1	49	30	4,969	−10.3	41	30	5,076	−5.5	56	30	4,965	−11.9	52	29	5,119	−3.6	42	29	5,115	−4.1	50
500	30	5,862	−8.8	52	30	5,790	−12.0	41	30	5,695	−15.1	34	30	5,817	−10.5	50	30	5,685	−16.7	47	29	5,866	−7.8	42	29	5,860	−8.4	45
450	30	6,677	−14.1	38	30	6,591	−17.7	34	30	6,489	−20.7	----	30	6,629	−16.0	43	30	6,477	−22.2	----	29	6,686	−13.1	40	29	6,677	−13.5	44
400	30	7,555	−20.3	----	29	7,458	−23.7	----	30	7,343	−27.0	----	30	7,497	−22.0	----	30	7,324	−28.5	----	29	7,567	−19.3	38	28	7,555	−19.8	42
350	29	8,529	−27.6	----	29	8,419	−31.2	----	30	8,291	−34.4	----	30	8,465	−29.2	----	30	8,267	−35.3	----	28	8,544	−26.4	----	28	8,531	−27.2	----
300	28	9,616	−36.4	----	29	9,493	−39.1	----	30	9,350	−42.7	----	29	9,543	−37.6	----	30	9,322	−43.6	----	28	9,640	−34.7	----	28	9,622	−35.8	----
250	28	10,854	−46.2	----	29	10,719	−47.6	----	29	10,555	−51.2	----	27	10,773	−46.5	----	30	10,526	−50.9	----	27	10,887	−44.6	----	25	10,858	−45.8	----
200	25	12,293	−56.2	----	28	12,170	−54.0	----	28	11,991	−54.3	----	22	12,253	−53.5	----	29	11,969	−54.6	----	27	12,343	−55.9	----	25	12,305	−56.9	----
175	20	13,142	−60.5	----	25	13,008	−56.6	----	27	12,843	−54.7	----	21	13,101	−56.0	----	28	12,816	−55.4	----	26	13,186	−61.0	----	24	13,145	−61.6	----
150	12	14,116	−66.1	----	22	13,971	−59.1	----	26	13,828	−54.9	----	20	14,072	−58.6	----	24	13,786	−54.3	----	26	14,133	−64.7	----	23	14,085	−64.9	----
125	6	15,238	−69.9	----	18	15,112	−61.3	----	21	14,999	−56.0	----	10	15,196	−60.8	----	17	14,946	−54.6	----	19	15,236	−66.0	----	18	15,196	−66.4	----
100	----	----	----	----	15	16,479	−63.2	----	13	16,414	−57.6	----	9	16,572	−62.7	----	13	16,375	−56.5	----	11	16,577	−66.3	----	8	16,528	−64.9	----
80	----	----	----	----	9	17,861	−62.1	----	6	17,832	−56.2	----	----	----	----	----	11	17,789	−56.2	----	5	17,927	−62.8	----	----	----	----	----
60	----	----	----	----	5	19,637	−59.2	----	----	----	----	----	----	----	----	----	7	19,622	−54.7	----	----	----	----	----	----	----	----	----
50	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	7	20,790	−53.6	----	----	----	----	----	----	----	----	----

See footnotes at end of table.

UNIVERSITY OF MICHIGAN LIBRARIES

Standard pressure surface (mb.)	Havana, Cuba [1] (.... mb.)				Honolulu, T. H. (1,015.4 mb.)				International Falls, Minn. (968.6 mb.)				Joliet, Ill. (992.5 mb.)				Lake Charles, La. (1,012.7 mb.)				Lander, Wyo. (827.7 mb.)				Las Vegas, Nev. (931.4 mb.)			
	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity
Surface	....	.....	.....	....	30	3	26.6	63	30	360	15.6	76	30	178	20.5	76	30	5	25.4	86	30	1,696	15.7	56	30	660	30.5	19
1,000	....	.....	.....	....	30	137	24.3	66	30	86	(*)	....	30	111	(*)	....	30	117	26.1	78	30	52	(*)	....	30	17	(*)	....
950	....	.....	.....	....	30	586	20.5	72	30	528	17.3	65	30	562	21.6	63	30	570	23.9	72	30	509	(*)	....	30	483	(*)	....
900	....	.....	.....	....	30	1,049	16.8	79	30	986	15.1	60	30	1,025	18.7	65	30	1,041	21.0	70	30	978	(*)	....	30	965	28.9	22
850	....	.....	.....	....	30	1,535	13.8	78	30	1,468	11.7	65	30	1,514	15.7	62	30	1,534	18.0	65	30	1,466	(*)	....	30	1,468	24.6	24
800	....	.....	.....	....	30	2,045	12.8	56	30	1,972	8.8	63	30	2,026	12.9	58	30	2,051	15.3	57	30	1,986	15.9	45	30	1,994	19.8	28
750	....	.....	.....	....	30	2,594	11.7	38	30	2,512	5.9	59	29	2,576	10.3	50	30	2,599	12.5	44	30	2,536	11.8	47	30	2,540	14.7	33
700	....	.....	.....	....	30	3,161	9.2	36	30	3,066	3.0	57	29	3,142	7.5	47	30	3,172	9.1	43	30	3,103	7.3	52	30	3,123	9.4	39
650	....	.....	.....	....	30	3,778	6.0	36	30	3,669	−.5	54	29	3,749	4.1	42	30	3,785	5.1	45	30	3,709	2.5	56	30	3,735	4.3	44
600	....	.....	.....	....	30	4,424	2.7	34	30	4,299	−4.0	46	29	4,395	.1	41	30	4,430	1.0	43	30	4,350	−2.4	55	29	4,383	−.3	44
550	....	.....	.....	....	30	5,124	−1.7	32	29	4,980	−8.0	40	29	5,087	−4.3	39	30	5,126	−3.2	40	30	5,035	−7.3	51	29	5,071	−5.3	42
500	....	.....	.....	....	30	5,875	−6.8	34	29	5,711	−12.7	38	29	5,832	−8.7	36	30	5,873	−7.8	42	30	5,771	−12.4	43	29	5,814	−10.2	34
450	....	.....	.....	....	30	6,694	−12.7	37	29	6,513	−18.2	35	29	6,649	−13.9	34	30	6,693	−13.1	37	30	6,575	−17.9	38	29	6,623	−15.8	....
400	....	.....	.....	....	30	7,578	−19.2	37	29	7,376	−24.4	....	29	7,527	−20.0	34	30	7,572	−19.3	36	30	7,438	−24.5	....	29	7,497	−22.5	....
350	....	.....	.....	....	30	8,557	−26.6	....	29	8,334	−31.4	....	29	8,503	−27.3	....	29	8,550	−26.7	....	30	8,395	−32.2	....	29	8,462	−30.4	....
300	....	.....	.....	....	30	9,651	−35.2	....	29	9,407	−39.3	....	29	9,593	−35.7	....	29	9,643	−35.3	....	30	9,464	−40.5	....	29	9,538	−38.6	....
250	....	.....	.....	....	28	10,900	−45.4	....	29	10,632	−48.1	....	29	10,835	−45.7	....	28	10,889	−45.0	....	30	10,681	−49.2	....	29	10,766	−47.6	....
200	....	.....	.....	....	28	12,351	−56.6	....	28	12,074	−54.5	....	26	12,279	−57.0	....	28	12,342	−56.1	....	29	12,127	−56.0	....	29	12,214	−55.0	....
175	....	.....	.....	....	28	13,187	−61.6	....	28	12,924	−56.2	....	25	13,107	−61.9	....	28	13,178	−61.8	....	28	12,981	−57.8	....	29	13,059	−58.7	....
150	....	.....	.....	....	28	14,134	−64.9	....	26	13,904	−56.6	....	20	14,045	−65.5	....	27	14,121	−67.3	....	24	13,951	−59.2	....	29	14,019	−62.1	....
125	....	.....	.....	....	28	15,238	−67.1	....	20	15,050	−56.9	....	19	15,159	−65.7	....	24	15,216	−71.8	....	17	15,086	−61.6	....	26	15,150	−65.4	....
100	....	.....	.....	....	27	16,581	−68.8	....	11	16,496	−58.5	....	14	16,516	−64.7	....	17	16,524	−72.3	....	12	16,463	−63.3	....	17	16,506	−66.4	....
80	....	.....	.....	....	26	17,920	−67.9	....	....	.....	.....	....	8	17,869	−61.8	....	8	17,867	−69.5	....	....	.....	.....	....	8	17,864	−63.6	....
60	....	.....	.....	....	23	19,675	−61.4	....	....	.....	.....	....	....	.....	.....	....	....	.....	.....	....	....	.....	.....	....	....	.....	.....	....
50	....	.....	.....	....	21	20,813	−57.2	....	....	.....	.....	....	....	.....	.....	....	....	.....	.....	....	....	.....	.....	....	....	.....	.....	....
40	....	.....	.....	....	16	22,227	−52.9	....	....	.....	.....	....	....	.....	.....	....	....	.....	.....	....	....	.....	.....	....	....	.....	.....	....
30	....	.....	.....	....	7	24,064	−50.9	....	....	.....	.....	....	....	.....	.....	....	....	.....	.....	....	....	.....	.....	....	....	.....	.....	....

Standard pressure surface (mb.)	Little Rock, Ark. (1,004.0 mb.)				Mazatlan, Mex. (1,007.6 mb.)				Medford, Oreg. (967.7 mb.)				Merida, Mex. (1,009.5 mb.)				Miami, Fla. (1,015.9 mb.)				Nantucket, Mass. (1,016.4 mb.)				Nashville, Tenn. (994.0 mb.)			
	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity
Surface	30	79	24.3	83	30	14	28.0	71	30	401	22.8	37	30	27	27.9	71	30	4	25.0	83	30	14	16.1	94	30	177	23.5	82
1,000	30	114	24.5	81	30	81	27.3	71	30	112	(*)	....	30	111	27.5	71	30	143	24.8	81	30	152	17.8	86	30	124	(*)	....
950	30	569	24.4	70	30	537	24.5	60	30	563	21.8	35	30	565	25.0	70	30	594	22.7	76	30	594	17.4	71	30	577	23.0	71
900	30	1,039	21.5	72	30	1,009	23.5	56	30	1,026	17.9	40	30	1,039	21.9	71	30	1,064	20.3	71	30	1,053	15.4	59	30	1,044	19.8	72
850	30	1,533	18.5	66	30	1,506	20.8	61	30	1,512	13.8	46	30	1,533	18.9	71	30	1,556	17.3	69	30	1,536	13.0	50	30	1,536	16.6	73
800	30	2,050	15.7	58	30	2,029	17.9	59	30	2,020	10.0	52	30	2,052	15.6	68	30	2,072	14.3	66	30	2,044	10.7	46	30	2,050	13.4	70
750	30	2,599	12.5	53	30	2,588	15.1	53	30	2,559	6.3	53	30	2,601	12.6	62	30	2,614	11.2	61	30	2,583	8.3	38	30	2,596	10.4	63
700	30	3,171	8.9	50	30	3,160	11.5	53	30	3,115	3.2	41	30	3,174	9.0	61	30	3,188	7.9	62	30	3,146	5.4	34	30	3,163	7.0	59
650	30	3,781	5.4	42	29	3,785	7.7	52	30	3,715	−.3	38	30	3,787	5.5	62	29	3,795	4.2	61	30	3,749	2.1	31	30	3,772	3.5	57
600	30	4,431	1.4	49	29	4,433	3.3	55	30	4,348	−4.1	33	30	4,436	2.0	56	29	4,442	.2	64	30	4,389	−1.6	30	30	4,414	−.3	51
550	30	5,127	−2.8	45	29	5,134	−1.3	55	30	5,032	−8.1	32	30	5,133	−2.1	53	29	5,137	−3.7	62	29	5,075	−5.7	30	30	5,107	−4.3	46
500	30	5,876	−7.2	43	29	5,888	−6.1	50	30	5,763	−12.6	33	30	5,885	−6.5	47	29	5,883	−7.6	56	29	5,814	−10.5	29	30	5,851	−8.7	38
450	30	6,701	−12.2	41	29	6,713	−10.9	41	30	6,565	−18.2	34	30	6,709	−11.5	42	29	6,704	−12.7	49	28	6,630	−15.8	29	29	6,668	−13.9	37
400	30	7,580	−18.4	41	29	7,602	−16.4	39	30	7,428	−24.7	....	30	7,595	−17.7	42	29	7,585	−18.8	51	28	7,501	−22.1	....	27	7,548	−19.5	39
350	29	8,564	−25.5	....	29	8,592	−23.5	34	29	8,388	−31.8	....	30	8,580	−24.8	....	29	8,566	−25.8	....	27	8,467	−29.4	....	27	8,526	−26.7	....
300	28	9,664	−33.9	....	29	9,700	−31.9	....	28	9,458	−40.0	....	30	9,681	−33.3	....	29	9,663	−34.2	....	27	9,548	−37.4	....	26	9,620	−35.1	....
250	28	10,916	−43.8	....	27	10,965	−41.6	....	27	10,682	−48.7	....	30	10,934	−43.4	....	29	10,910	−44.6	....	27	10,781	−46.6	....	26	10,865	−44.8	....
200	26	12,387	−54.7	....	27	12,439	−53.6	....	24	12,136	−55.7	....	29	12,396	−55.1	....	29	12,363	−56.6	....	24	12,227	−57.2	....	24	12,322	−55.0	....
175	25	13,226	−60.2	....	27	13,277	−60.1	....	24	12,981	−57.7	....	29	13,235	−61.6	....	29	13,197	−62.7	....	22	13,058	−61.5	....	23	13,162	−60.4	....
150	21	14,181	−64.3	....	24	14,239	−66.4	....	22	13,951	−58.7	....	27	14,174	−68.2	....	28	14,131	−68.0	....	19	14,023	−63.2	....	23	14,111	−65.0	....
125	17	15,271	−66.4	....	17	15,330	−72.2	....	17	15,097	−59.2	....	21	15,256	−73.3	....	21	15,214	−71.6	....	14	15,128	−64.1	....	18	15,202	−66.1	....
100	15	16,620	−68.1	....	12	16,637	−74.8	....	11	16,510	−60.8	....	5	16,557	−75.3	....	10	16,549	−70.6	....	9	16,470	−62.8	....	7	16,575	−67.8	....
80	10	17,965	−66.4	....	6	17,931	−75.8	....	7	17,893	−60.3	....	....	.....	.....	....	....	.....	.....	....	....	.....	.....	....	6	17,937	−65.7	....
60	....	.....	.....	....	5	19,626	−70.0	....	7	19,691	−58.4	....	....	.....	.....	....	....	.....	.....	....	....	.....	.....	....	....	.....	.....	....

Standard pressure surface (mb.)	New Orleans, La. (1,014.3 mb.)				North Platte, Nebr. (914.7 mb.)				Oakland, Calif. (1,012.1 mb.)				Oklahoma City, Okla. (966.3 mb.)				Omaha, Nebr. (975.3 mb.)				Phoenix, Ariz. (967.5 mb.)				Pittsburgh, Pa. (972.0 mb.)			
	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity
Surface	30	2	25.2	85	30	849	19.9	77	30	6	16.3	71	30	391	24.5	77	30	308	23.2	76	30	339	31.3	25	30	382	21.2	68
1,000	30	127	25.8	79	30	68	(*)	....	30	108	15.2	71	30	87	(*)	....	30	88	(*)	....	30	40	(*)	....	30	132	(*)	....
950	30	582	23.7	74	30	523	(*)	....	30	553	17.8	54	30	542	25.1	68	30	540	22.1	68	30	503	32.8	21	30	585	21.6	62
900	30	1,051	20.7	74	30	989	20.6	68	30	1,008	19.9	29	30	1,015	22.5	67	30	1,006	19.8	67	30	986	29.0	22	30	1,048	19.1	61
850	30	1,543	17.6	72	30	1,482	18.2	63	30	1,498	17.6	26	30	1,511	19.3	65	30	1,497	17.3	65	30	1,491	24.6	25	30	1,538	15.8	63
800	30	2,059	14.6	66	30	2,001	15.1	60	30	2,012	14.7	22	30	2,030	16.3	59	30	2,013	14.2	65	30	2,017	19.9	29	30	2,050	12.7	58
750	30	2,606	11.7	60	30	2,547	11.3	57	30	2,560	11.4	21	30	2,580	13.3	50	30	2,563	11.0	61	30	2,575	15.0	35	30	2,593	9.9	54
700	30	3,178	8.6	55	30	3,116	7.6	56	30	3,127	7.9	20	30	3,154	9.6	51	30	3,128	7.5	58	30	3,147	10.0	41	30	3,160	6.8	53
650	30	3,790	5.1	51	30	3,724	3.3	57	30	3,736	4.2	22	30	3,765	5.4	51	30	3,741	3.6	53	30	3,766	5.3	45	30	3,771	3.4	51
600	30	4,438	1.2	50	30	4,367	−1.0	53	30	4,380	.1	22	30	4,414	.9	47	30	4,380	−.3	51	30	4,407	.1	47	30	4,411	−.2	46
550	30	5,134	−2.7	44	29	5,059	−5.5	50	29	5,071	−4.3	22	30	5,108	−3.6	45	30	5,072	−4.6	45	30	5,100	−4.8	48	30	5,104	−4.0	39
500	30	5,883	−7.1	42	29	5,799	−10.1	42	29	5,816	−9.4	....	30	5,854	−8.4	41	29	5,818	−9.4	37	29	5,844	−9.3	39	30	5,849	−8.3	37
450	29	6,705	−12.5	40	28	6,612	−15.6	37	29	6,620	−15.2	....	29	6,673	−13.6	35	29	6,630	−14.8	34	29	6,658	−14.7	33	30	6,668	−13.7	36
400	29	7,585	−18.7	40	27	7,479	−22.1	....	29	7,502	−22.0	....	29	7,550	−20.0	35	29	7,507	−21.3	....	29	7,531	−21.2	....	30	7,544	−20.1	37
350	29	8,566	−25.8	....	27	8,446	−29.3	....	29	8,470	−29.6	....	29	8,526	−27.2	....	28	8,475	−28.5	....	29	8,502	−28.9	....	29	8,520	−27.3	....
300	29	9,664	−34.2	....	27	9,527	−38.0	....	29	9,551	−37.9	....	29	9,617	−35.6	....	28	9,562	−36.7	....	28	9,586	−37.4	....	28	9,611	−35.8	....
250	29	10,914	−43.9	....	25	10,765	−47.5	....	28	10,788	−46.9	....	28	10,858	−45.1	....	28	10,799	−46.4	....	27	10,821	−46.5	....	28	10,853	−45.5	....
200	28	12,372	−55.4	....	24	12,197	−57.2	....	28	12,238	−55.0	....	25	12,325	−55.4	....	28	12,246	−56.8	....	22	12,258	−55.9	....	27	12,306	−56.0	....
175	24	13,218	−60.8	....	23	13,031	−60.7	....	28	13,084	−57.9	....	22	13,166	−60.0	....	27	13,084	−61.8	....	22	13,098	−59.9	....	23	13,154	−61.0	....
150	22	14,171	−66.0	....	18	14,011	−62.0	....	27	14,043	−60.1	....	21	14,121	−64.0	....	22	14,032	−62.7	....	21	14,053	−63.2	....	21	14,124	−65.1	....
125	12	15,249	−69.5	....	13	15,120	−64.5	....	23	15,182	−61.6	....	8	15,220	−65.8	....	17	15,165	−64.1	....	15	15,136	−65.1	....	17	15,243	−66.2	....
100	....	.....	.....	....	6	16,444	−63.4	....	20	16,551	−63.2	....	....	.....	.....	....	11	16,526	−63.3	....	9	16,477	−66.8	....	7	16,592	−64.1	....
80	....	.....	.....	....	....	.....	.....	....	15	17,926	−62.4	....	....	.....	.....	....	8	17,885	−62.3	....	....	.....	.....	....	....	.....	.....	....
60	....	.....	.....	....	....	.....	.....	....	8	19,715	−58.7	....	....	.....	.....	....	....	.....	.....	....	....	.....	.....	....	....	.....	.....	....

See footnotes at end of table.

Standard pressure surface (mb.)	Portland, Maine (1,013.7 mb.)				Rapid City, S. Dak. (900.1 mb.)				St. Cloud, Minn. (974.0 mb.)				San Antonio, Tex. (983.8 mb.)				San Juan, P. R. (1,015.8 mb.)				Santa Maria, Calif. (1,004.7 mb.)				Sault Ste. Marie, Mich. (987.5 mb.)			
	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity
Surface	30	20	15.8	83	30	980	16.6	70	30	317	19.4	73	30	240	26.1	73	30	15	25.9	82	30	71	14.5	80	30	221	13.9	83
1,000	30	135	16.9	75	30	66	(*)	----	30	87	(*)	----	30	95	(*)	----	30	154	25.2	81	30	111	14.0	80	30	113	(*)	----
950	30	578	17.4	64	30	520	(*)	----	30	536	20.4	59	30	553	25.4	71	30	605	21.9	83	30	551	14.8	69	30	555	16.4	65
900	30	1,035	15.3	61	30	984	(*)	----	30	998	17.5	59	30	1,024	22.4	73	30	1,072	18.8	81	30	1,007	19.8	30	30	1,011	15.6	60
850	30	1,518	12.4	59	30	1,472	17.7	51	30	1,484	14.5	59	30	1,520	19.2	72	30	1,562	16.1	73	30	1,498	19.2	25	30	1,495	13.1	61
800	30	2,024	9.4	57	30	1,987	14.1	54	30	1,994	11.4	57	30	2,039	16.3	62	30	2,076	13.8	63	30	2,017	15.9	26	30	2,002	10.3	58
750	30	2,561	6.3	53	30	2,535	10.3	58	30	2,538	8.4	53	30	2,591	13.9	44	30	2,622	11.5	51	30	2,561	12.6	24	30	2,543	7.7	52
700	30	3,120	3.4	44	30	3,099	6.7	57	30	3,098	5.5	47	30	3,166	11.1	36	30	3,193	8.4	46	30	3,134	8.9	27	30	3,103	4.8	48
650	30	3,721	.2	40	30	3,707	2.6	57	30	3,706	2.1	43	29	3,784	7.2	38	30	3,804	4.7	46	30	3,744	5.0	30	30	3,708	1.3	45
600	30	4,355	−3.4	39	30	4,347	−1.8	54	30	4,342	−1.9	42	29	4,435	2.6	41	30	4,450	1.1	41	30	4,391	1.0	28	30	4,345	−1.9	38
550	30	5,039	−7.3	35	30	5,035	−6.2	49	30	5,031	−6.0	38	29	5,133	−2.2	42	29	5,148	−2.7	37	30	5,087	−3.2	26	30	5,033	−5.7	36
500	30	5,775	−12.0	34	30	5,773	−11.1	44	30	5,769	−10.6	35	29	5,883	−7.2	38	29	5,894	−7.2	38	30	5,832	−8.1	----	30	5,773	−10.5	34
450	30	6,581	−17.6	----	30	6,582	−16.6	40	30	6,578	−16.2	32	28	6,706	−12.4	33	29	6,716	−12.8	40	30	6,650	−14.0	----	30	6,580	−16.0	----
400	30	7,445	−23.7	----	30	7,449	−22.7	----	30	7,449	−22.1	----	28	7,587	−18.7	----	29	7,596	−19.1	38	30	7,527	−21.0	----	30	7,453	−22.4	----
350	29	8,408	−31.2	----	30	8,414	−30.3	----	30	8,417	−29.3	----	28	8,568	−25.7	----	29	8,576	−26.4	----	30	8,496	−28.5	----	30	8,419	−29.6	----
300	28	9,479	−39.8	----	30	9,492	−38.3	----	30	9,499	−37.4	----	28	9,668	−33.6	----	28	9,669	−35.0	----	29	9,586	−37.2	----	30	9,500	−37.9	----
250	27	10,694	−49.0	----	30	10,721	−47.1	----	30	10,734	−46.2	----	26	10,923	−43.0	----	27	10,916	−45.3	----	29	10,822	−46.0	----	28	10,744	−47.0	----
200	21	12,148	−58.5	----	28	12,167	−54.8	----	30	12,186	−55.5	----	24	12,395	−53.4	----	27	12,365	−57.5	----	29	12,276	−54.9	----	23	12,193	−57.1	----
175	20	12,990	−61.8	----	25	13,018	−56.1	----	28	13,035	−58.2	----	21	13,244	−58.6	----	26	13,196	−63.8	----	29	13,122	−58.4	----	17	13,042	−61.5	----
150	16	13,960	−63.7	----	22	13,993	−57.9	----	28	14,000	−60.0	----	21	14,200	−64.2	----	23	14,123	−69.6	----	29	14,083	−62.1	----	9	13,097	−61.3	----
125	11	15,163	−62.9	----	18	15,150	−60.0	----	21	15,136	−60.7	----	13	15,329	−69.0	----	14	15,190	−72.6	----	27	15,204	−64.6	----	----	----	----	----
100	----	----	----	----	14	16,543	−61.1	----	16	16,523	−61.0	----	----	----	----	----	7	16,495	−72.2	----	22	16,555	−66.6	----	----	----	----	----
80	----	----	----	----	----	----	----	----	11	17,900	−58.5	----	----	----	----	----	----	----	----	----	9	17,897	−64.0	----	----	----	----	----
60	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	5	19,633	−60.7	----	----	----	----	----

Standard pressure surface (mb.)	Spokane, Wash. (929.3 mb.)				Swan Island, W. I.[1] (---------- mb.)				Tacubaya, Mex. (773.4 mb.)				Tampa, Fla. (1,015.7 mb.)				Tatoosh Island, Wash. (1,015.2 mb.)				Toledo, Ohio (991.7 mb.)				Washington, D. C. (1,014.1 mb.)			
	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity
Surface	30	721	20.3	32	----	----	----	----	30	2,306	17.5	64	29	9	24.4	85	29	31	10.9	88	30	191	21.2	76	30	25	22.9	72
1,000	30	82	(*)	----	----	----	----	----	30	43	(*)	----	29	146	24.1	79	29	157	10.3	84	30	118	(*)	----	30	146	22.6	70
950	30	534	(*)	----	----	----	----	----	30	512	(*)	----	29	598	22.2	72	29	586	10.0	69	30	569	22.0	61	30	595	20.5	66
900	30	996	18.4	33	----	----	----	----	30	989	(*)	----	29	1,064	19.5	68	29	1,032	9.1	60	30	1,033	19.0	62	30	1,058	17.7	70
850	30	1,482	14.0	37	----	----	----	----	30	1,485	(*)	----	29	1,554	16.5	65	29	1,504	6.7	60	30	1,522	15.7	61	30	1,546	14.9	69
800	30	1,989	9.4	44	----	----	----	----	30	2,018	(*)	----	29	2,068	13.4	65	29	1,999	4.4	56	30	2,034	12.8	57	30	2,057	11.9	64
750	30	2,522	4.7	50	----	----	----	----	30	2,570	15.8	61	29	2,616	10.1	65	29	2,527	1.8	49	30	2,583	9.8	54	30	2,599	9.1	60
700	30	3,078	.3	54	----	----	----	----	30	3,151	11.4	66	29	3,181	7.0	61	29	3,076	−1.1	43	30	3,144	6.7	47	30	3,165	6.7	51
650	30	3,669	−3.9	54	----	----	----	----	30	3,769	6.8	72	29	3,792	3.6	59	29	3,665	−4.5	42	30	3,755	3.4	37	30	3,773	3.2	48
600	30	4,294	−7.8	48	----	----	----	----	30	4,421	2.1	77	29	4,433	−.2	58	29	4,289	−8.0	37	30	4,395	−.1	36	30	4,415	−.6	45
550	30	4,968	−12.0	39	----	----	----	----	29	5,118	−2.2	76	29	5,126	−4.1	59	29	4,962	−12.0	37	30	5,089	−4.3	38	30	5,108	−4.3	41
500	30	5,688	−16.9	39	----	----	----	----	29	5,871	−6.0	64	29	5,871	−8.5	53	29	5,683	−16.6	36	30	5,831	−9.0	----	30	5,851	−9.0	40
450	30	6,477	−22.0	----	----	----	----	----	28	6,701	−10.7	56	29	6,688	−13.6	50	29	6,470	−21.9	----	30	6,648	−14.0	----	30	6,666	−14.3	43
400	30	7,327	−28.1	----	----	----	----	----	28	7,587	−16.2	49	29	7,566	−19.7	45	29	7,324	−27.9	----	30	7,524	−20.2	----	30	7,543	−20.3	----
350	30	8,292	−35.2	----	----	----	----	----	26	8,576	−23.4	----	27	8,547	−26.7	----	29	8,270	−34.5	----	30	8,499	−27.6	----	30	8,517	−27.6	----
300	30	9,329	−42.3	----	----	----	----	----	25	9,684	−32.2	----	27	9,639	−35.4	----	28	9,343	−41.1	----	29	9,589	−36.3	----	30	9,607	−35.8	----
250	27	10,544	−49.3	----	----	----	----	----	25	10,944	−42.6	----	26	10,880	−45.6	----	28	10,563	−47.8	----	29	10,827	−46.4	----	30	10,847	−45.3	----
200	21	12,000	−53.4	----	----	----	----	----	23	12,410	−54.9	----	26	12,327	−57.3	----	26	12,009	−53.0	----	25	12,277	−57.5	----	30	12,299	−56.4	----
175	16	12,872	−54.0	----	----	----	----	----	18	13,260	−61.5	----	24	13,159	−63.4	----	26	12,868	−54.1	----	24	13,109	−62.7	----	30	13,136	−61.5	----
150	15	13,859	−55.2	----	----	----	----	----	11	14,207	−68.1	----	23	14,089	−68.6	----	25	13,853	−54.3	----	16	14,087	−66.0	----	30	14,083	−64.8	----
125	12	15,023	−54.9	----	----	----	----	----	----	----	----	----	20	15,180	−71.2	----	22	15,035	−54.7	----	13	15,176	−66.3	----	25	15,190	−66.2	----
100	9	16,463	−57.4	----	----	----	----	----	----	----	----	----	15	16,488	−71.1	----	20	16,461	−54.7	----	8	16,538	−65.8	----	20	16,552	−65.8	----
80	8	17,874	−56.0	----	----	----	----	----	----	----	----	----	7	17,818	−67.9	----	14	17,882	−54.2	----	5	17,900	−62.8	----	13	17,902	−63.3	----
60	5	19,722	−54.9	----	----	----	----	----	----	----	----	----	----	----	----	----	7	19,717	−53.9	----	----	----	----	----	----	----	----	----

[1] Data not yet received.

*Temperature and relative humidity data for this level are not available or are available only for certain days. See note entitled "Change in Summarization of Radiosonde Data," p. 6, in the January 1946 issue of the MONTHLY WEATHER REVIEW.

NOTE.—All observations scheduled between 0300 and 0500, G. C. T. except at Ciudad, Victoria, Mazatlan and Merida, where they are taken near 0200, G. C. T. "Number of observations" refers to those of dynamic height only. (In a few cases temperature or humidity data may be missing for one or more standard pressure surfaces of some observations.) Relative humidity data are not published for standard pressure surfaces having a corresponding mean temperature below −20° C. Relative humidity data beginning with October 1, 1948, were computed, and expressed in these tables, on the basis of vapor pressure over water. Upper air values of relative humidity at levels with temperatures less than 0° C. have formerly been computed and expressed on the basis of the vapor pressure over ice. All relative humidity observations are obtained by electric hygrometer and have been adjusted to compensate for the values occurring below the operating range of the humidity element. For explanation of the adjustment see article entitled "Curve Method for Obtaining Monthly Means of Relative Humidity," p. 241, MONTHLY WEATHER REVIEW, December 1944.

None of the means included in these tables are based on less than 15 observations at the surface or 5 observations at a standard pressure level.

LATE REPORT FOR MAY 1949

TABLE 1

Standard pressure surface (mb.)	Swan Island, W. I. (1,012.4 mb.)				Standard pressure surface (mb.)	Swan Island, W. I. (1,012.4 mb.)			
	Number of observations	Dynamic height	Temperature	Relative humidity		Number of observations	Dynamic height	Temperature	Relative humidity
Surface	28	10	26.1	82	450	26	6,697	−11.5	
1,000	28	118	25.5	81	400	25	7,584	−17.6	
950	28	577	22.7	82	350	25	8,570	−24.6	
900	28	1,040	19.9	77	300	25	9,674	−32.6	
850	28	1,531	17.2	70	250	24	10,934	−42.1	
800	28	2,047	14.5	61	200	24	12,406	−53.7	
750	28	2,596	11.7	58	175	23	13,249	−60.0	
700	28	3,166	8.8	50	150	20	14,201	−66.0	
650	28	3,779	5.4	48	125	18	15,283	−71.1	
600	28	4,426	1.9	40	100	9	16,614	−75.7	
550	27	5,123	−2.1	36	80	6	17,911	−75.8	
500	27	5,874	−6.5	34					

TABLE 2.—*Free-air resultant winds based on pilot balloon observations made near 2200 G. C. T. during June 1949. Directions given in degrees from north (N=360°, E=90°, S=180°, W=270°). Speeds in meters per second*

Altitude (meters) m. s. l.	Abilene Tex. (534 m.)			Albuquerque, N. Mex. (1,627 m.)			Atlanta, Ga. (299 m.)			Billings, Mont. (1,095 m.)			Bismarck, N. Dak. (505 m.)			Boise, Idaho (868 m.)			Brownsville, Tex. (7 m.)			Buffalo, N. Y. (220 m.)			Burlington, Vt. (100 m.)			Charleston, S. C. (16 m.)			Cincinnati, Ohio (273 m.)			Denver, Colo. (1,618 m.)			El Paso, Tex. (1,198 m.)		
	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed
Surface	30	162	4.8	30	265	2.1	30	262	0.5	29	333	1.9	30	241	2.2	30	315	5.0	30	131	7.2	30	233	3.9	30	230	2.2	29	218	1.0	29	226	1.5	30	100	1.1	30	242	2.7
500							30	276	.3										30	141	7.7	30	238	5.3	30	231	4.8	29	182	1.6	29	224	1.8								
1,000	30	169	5.9				30	349	.3				30	250	2.4	30	314	5.1	29	155	6.4	29	240	5.5	30	240	5.3	24	246	1.8	28	223	2.5								
1,500	30	178	6.9				27	319	1.3	29	316	2.0	29	253	3.3	30	313	4.7	27	165	4.6	28	242	6.3	30	259	6.3	23	267	2.6	28	217	3.0				30	255	4.1
2,000	30	268	6.8	30	242	3.5	27	327	1.7	29	279	2.1	28	249	5.0	30	301	4.1	23	170	4.2	27	249	6.5	28	262	7.9	21	267	2.8	26	223	2.6	30	104	1.5	30	258	3.6
2,500	30	195	6.1	30	240	3.3	22	1	2.2	26	257	4.0	26	257	6.6	30	280	4.2	18	182	3.4	24	261	6.2	26	266	8.3	21	281	2.9	22	234	2.5	29	157	1.1	30	248	3.5
3,000	30	211	2.9	30	248	3.7	20	359	2.2	25	252	5.6	25	256	9.4	30	275	4.7	18	182	1.7	23	271	7.7	26	278	8.9	20	288	2.8	20	272	3.3	28	212	1.6	30	254	4.0
4,000	30	236	4.8	29	250	6.6	16	295	2.5	21	257	11.0	23	266	12.7	30	263	5.4	17	203	1.8	17	291	10.6	22	285	9.6	19	264	3.0	18	278	5.5	24	256	6.1	29	246	4.6
5,000	27	268	5.1	24	249	8.2	13	311	4.1	17	264	11.2	20	258	13.4	29	261	8.1	17	267	1.1	15	292	12.5	20	283	11.2	17	265	2.8	16	269	5.3	21	250	7.8	29	251	4.8
6,000	24	276	5.5	23	241	9.2				13	251	10.7	15	255	16.2	22	272	9.6	16	249	2.5	10	309	12.7	13	303	11.5	14	270	3.8	13	262	6.8	16	255	11.2	27	242	5.2
8,000	17	267	3.7	18	246	12.0				10	253	13.8				16	267	14.9	11	282	5.8							12	239	6.4				11	258	10.9	22	249	8.3
10,000				14	249	16.7																														12	266	14.0

Altitude (meters) m. s. l.	Ely, Nev. (1,910 m.)			Grand Junction, Colo. (1,475 m.)			Greensboro, N. C. (271 m.)			Havre, Mont. (767 m.)			Jacksonville, Fla. (16 m.)			Joliet, Ill. (178 m.)			Las Vegas, Nev. (663 m.)			Little Rock, Ark. (88 m.)			Medford, Oreg. (416 m.)			Miami, Fla. (12 m.)			Mobile, Ala. (66 m.)			Nashville, Tenn. (182 m.)			New York, N. Y. (15 m.)		
	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed
Surface	30	246	3.2	30	254	1.7	29	90	1.5	30	266	3.1	28	108	1.2	30	195	1.8	30	207	2.6	28	139	0.8	30	304	2.8	29	127	3.2	29	194	1.5	30	259	1.3	30	177	3.3
500							29	98	1.5				28	157	.9	30	205	2.0				28	197	1.9	30	308	3.0	29	142	3.4	29	199	1.6	30	246	1.6	30	194	4.5
1,000							29	115	1.4	30	260	4.4	28	253	1.0	28	216	3.6	30	200	3.2	28	270	2.2	30	323	3.1	29	161	2.3	26	261	1.5	30	243	2.0	29	229	3.7
1,500				30	271	1.8	27	86	.5	30	266	4.9	26	288	2.1	26	244	4.1	30	212	3.1	26	249	2.7	30	323	2.0	29	184	1.6	21	303	1.8	28	245	2.2	27	265	4.0
2,000	30	252	3.3	30	252	3.9	27	319	.7	30	274	5.5	26	298	3.1	25	265	4.9	30	223	3.2	24	269	2.6	30	306	.6	28	224	1.1	18	323	2.4	27	253	1.8	25	271	5.4
2,500	30	243	3.4	30	244	4.2	25	328	2.0	28	267	6.3	24	304	3.3	20	271	4.4	30	226	4.4	23	286	3.3	30	296	1.1	24	254	1.5	14	345	3.3	26	251	1.5	25	282	5.6
3,000	29	240	3.7	28	243	4.6	23	332	3.0	24	268	8.5	21	307	2.8	19	277	5.1	30	240	6.1	20	307	3.9	30	302	2.7	23	247	2.1	10	333	3.5	25	274	2.7	22	280	5.4
4,000	26	251	3.8	24	235	5.4	19	352	3.9	15	278	8.9	13	321	3.3	16	289	7.9	28	250	7.2	14	343	4.6	29	291	5.9	22	237	2.6				22	277	4.2	20	299	5.9
5,000	19	259	7.6	21	252	8.2	16	344	4.2	11	274	11.3	10	309	3.6				27	258	7.6	10	5	3.3	29	292	8.2	17	258	2.5				16	281	6.1	18	292	7.5
6,000	15	273	11.1	18	247	11.3	15	324	3.8										25	255	8.7				28	288	10.5	13	247	2.6				12	265	7.4	13	300	6.7
8,000	10	254	14.8	11	257	17.2													22	260	10.3				21	279	14.8												
10,000																			17	262	18.3				11	277	16.5												
12,000																			10	251	17.2																		

Altitude (meters) m. s. l.	Oakland, Calif. (8 m.)			Oklahoma City, Okla. (396 m.)			Omaha, Nebr. (306 m.)			Phoenix, Ariz. (338 m.)			Rapid City, S. Dak. (982 m.)			St. Cloud, Minn. (318 m.)			St. Louis, Mo. (181 m.)			San Antonio, Tex. (240 m.)			San Diego, Calif. (13 m.)			Sault Ste. Marie, Mich. (221 m.)			Seattle, Wash. (116 m.)			Spokane, Wash. (725 m.)			Washington, D. C. (24 m.)		
	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed
Surface	30	280	5.6	30	184	5.2	30	160	2.7	30	251	1.3	30	249	0.5	30	225	1.7	30	178	1.1	29	128	3.7	28	262	3.7	29	291	2.0	30	277	2.6	30	238	3.9	27	153	2.2
500	30	286	3.9	30	187	5.3	30	169	3.5	30	257	2.3				30	221	2.6	30	194	1.6	29	142	4.7	28	264	2.3	29	279	3.0	30	263	2.9				27	175	2.9
1,000	28	282	2.2	30	195	5.7	29	176	4.7	30	257	3.4	30	253	.5	30	224	3.7	29	225	2.6	29	147	5.0	25	318	1.6	27	259	4.4	29	261	2.4	30	239	5.0	26	201	2.9
1,500	28	287	1.5	29	207	6.4	27	206	5.1	30	248	3.9	30	286	1.4	28	229	4.9	29	247	2.6	27	155	5.0	24	297	1.2	25	256	5.1	25	254	2.3	30	240	4.9	26	229	2.8
2,000	27	302	2.3	28	216	6.7	23	234	5.3	30	240	4.3	29	278	2.1	25	243	6.4	27	276	3.1	26	169	4.2	24	249	1.5	23	266	6.3	25	260	2.2	29	242	5.9	24	256	2.2
2,500	27	310	2.2	28	216	6.7	23	242	5.9	30	238	5.0	28	257	4.2	22	256	7.0	23	297	3.7	22	186	2.9	22	237	2.2	21	277	7.6	21	256	4.1	28	245	5.7	21	269	2.6
3,000	27	301	2.7	26	224	6.1	23	244	6.3	29	241	5.6	25	257	6.4	20	259	8.6	21	305	3.9	22	28	1.1	21	235	2.9	18	285	9.5	18	268	5.0	25	247	5.1	20	298	3.6
4,000	27	288	4.5	23	268	3.1	20	257	8.1	28	238	6.5	19	258	10.4	16	259	12.3	16	300	6.4	21	290	2.7	21	255	4.3	17	290	11.3	15	280	8.1	22	254	7.4	17	291	4.9
5,000	27	290	6.2	21	255	5.3	19	264	8.9	25	235	7.1	17	246	10.5	10	261	13.7				16	269	3.3	19	259	5.3	15	296	12.3	13	275	10.8	18	262	10.8	16	282	5.1
6,000	27	290	7.9	19	270	3.9	19	260	10.5	21	250	6.2	14	243	13.0							12	266	4.9	19	262	7.5				11	289	13.9	17	255	12.4	16	293	6.1
8,000	26	288	10.3	15	272	5.0	12	262	16.0	15	253	9.4													11	280	11.1												
10,000	22	282	12.4				10	259	17.2	11	260	11.8																												
12,000	12	263	15.4																																					

TABLE 3.—*Free-air resultant winds based on rawin observations made near 0300 G. C. T., during June 1949. Directions given in degrees from north (N=360°, E=90°, S=180°, W=270°). Speeds in meters per second*

Altitude (meters) m. s. l.	Albuquerque, N. Mex. (1,636 m.)			Big Spring, Tex. (774 m.)			Bismarck, N. Dak. (505 m.)			Brownsville, Tex. (7 m.)			Caribou, Maine (191 m.)			Charleston, S. C. (13 m.)			Columbia, Mo. (237 m.)			Grand Junction, Colo. (1,473 m.)			Greensboro, N. C. (275 m.)			Hatteras, N. C. (3 m.)			International Falls, Minn. (358 m.)			Little Rock, Ark. (80 m.)			Medford, Oreg. (401 m.)		
	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed
Surface	30	99	1.1	30	143	5.2	30	93	1.9	29	131	4.5	30	221	2.0	30	168	0.8	30	133	1.6	30	188	0.2	30	145	1.1	30	160	2.3	30	193	0.8	30	142	0.8	30	328	4.5
500				30	156	7.8	30	129	1.1	29	97	9.6	30	251	5.2	30	208	1.6	30	173	4.3				30	153	2.2	30	180	3.7	30	221	2.5	29	179	4.7	30	328	5.2
1,000				30	167	8.7	30	232	2.3	29	145	6.2	30	274	8.0	30	251	.8	30	211	5.1	30	200	.4	30	149	.9	29	200	1.3	30	257	6.3	28	262	3.1	28	315	4.1
1,500				30	183	6.4	30	264	5.1	29	154	5.3	30	278	8.4	30	261	.6	30	228	4.7	30	242	2.6	30	360	.1	29	226	1.4	30	264	6.9	28	232	3.0	28	304	2.5
2,000	29	267	1.9	30	203	4.3	30	271	7.7	29	156	3.9	30	286	8.7	30	320	.3	30	235	4.6	30	248	2.9	30	5	.4	29	200	1.7	30	267	8.7	28	251	2.6	28	282	2.4
2,500	29	269	4.2	30	223	4.3	30	271	10.7	29	167	1.7	29	284	12.1	30	8	.2	30	286	3.8	30	249	5.2	30	176	.5	28	188	1.7	30	267	12.5	28	301	3.7	30	291	5.2
3,000	29	277	4.5	30	238	2.5	30	271	8.2	29	142	2.5	30	286	9.6	30	257	.6	30	259	3.5	30	247	3.9	30	140	.3	28	200	2.4	30	267	10.1	28	270	2.6	29	285	3.0
4,000	29	261	5.9	30	271	4.1	30	271	10.7	29	167	1.7	29	284	12.1	30	8	.2	30	286	3.8	30	249	5.2	30	176	.5	28	188	1.7	30	267	12.5	28	301	3.7	30	291	5.2
5,000	29	253	7.2	29	272	5.1	30	273	12.8	29	148	.8	27	286	13.0	29	356	1.0	30	297	4.7	30	252	7.1	30	85	.7	27	171	1.2	28	258	14.4	28	290	5.0	30	293	8.7
6,000	29	263	8.6	28	266	4.8	30	267	13.9	29	239	.2	27	284	16.5	29	333	1.6	30	273	5.2	30	252	9.6	30	358	1.2	27	270	.5	28	259	16.8	29	289	5.0	29	293	11.4
8,000	28	256	9.2	28	270	6.6	29	260	18.2	29	286	2.9	25	293	20.4	29	317	3.3	30	267	7.3	26	251	11.4	30	312	2.2	26	280	3.0	27	259	21.1	25	265	3.6	24	278	13.5
10,000	24	262	9.0	27	240	11.4	26	253	19.7	28	304	7.9	18	285	22.6	29	303	4.9	30	252	10.9	23	248	12.7	29	293	6.6	25	299	6.8	22	253	23.5	23	268	4.6	21	283	15.1
12,000	18	264	10.8	25	243	16.2	19	256	17.8	24	310	11.3	10	287	14.7	26	315	7.7	28	265	10.6	12	267	9.4	27	279	10.5	22	294	7.4	14	249	24.3	22	246	8.3	16	278	18.2
14,000	10	286	5.3	22	247	15.6	13	256	14.2	16	316	11.2				22	314	7.3	19	286	12.0	11	258	8.7	25	313	8.2	21	314	7.2				19	278	12.5			
16,000				14	255	4.3	11	265	6.8																16	352	4.4	13	355	4.1				11	278	4.1			

Altitude (meters) m. s. l.	Miami, Fla. (12 m.)			Nantucket, Mass. (14 m.)			Nashville, Tenn. (180 m.)			New Orleans, La. (6 m.)			Oakland, Calif. (8 m.)			Oklahoma City, Okla. (392 m.)			Rapid City, S. Dak. (980 m.)			San Antonio, Tex. (242 m.)			San Juan, P. R. (28 m.)			St. Cloud, Minn. (318 m.)			Santa Maria, Calif. (72 m.)			Sault Ste. Marie, Mich. (221 m.)			Spokane, Wash. (726 m.)		
	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed	Observations	Direction	Speed
Surface	30	147	0.8	30	194	2.2	30	218	0.8	30	187	1.9	30	278	5.0	29	140	4.6	30	207	1.0	30	116	4.4	30	106	4.5	30	127	0.3	30	280	4.0	30	249	0.5	30	233	2.4
500	30	159	2.9	30	235	6.8	30	210	2.1	29	173	1.1	30	284	5.2	29	147	6.2				30	136	7.9	30	95	8.6	30	173	1.4	30	312	3.3	30	235	2.5			
1,000	30	164	3.2	30	256	6.1	30	210	2.3	29	173	1.1	30	292	4.9	29	172	9.4	30	207	1.0	30	148	8.4	30	100	8.8	30	204	2.9	30	321	3.6	30	248	5.2	29	247	4.5
1,500	30	163	2.2	30	264	5.1	30	217	2.4	30	90	.9	30	304	3.7	29	187	8.2	30	210	1.0	30	148	6.0	30	101	8.2	29	227	4.0	30	337	3.3	30	254	6.4	29	254	5.8
2,000	30	160	2.0	30	277	5.0	30	216	2.4	30	44	1.1	30	313	3.2	29	194	5.8	30	231	2.2	30	165	4.7	30	98	7.6	28	239	4.5	30	330	2.4	30	259	6.9	30	257	5.8
2,500	30	171	1.7	30	270	5.2	30	218	1.8	29	16	1.0	30	313	2.6	29	216	4.5	30	249	3.5	30	170	3.7	30	99	6.8	28	248	5.5	30	208	2.6	30	271	7.6	28	257	5.1
3,000	30	163	1.4	30	271	5.3	30	241	2.1	30	21	.9	30	302	3.2	29	316	2.6	29	256	5.3	29	132	1.5	30	96	6.4	29	260	6.8	30	298	3.9	30	276	8.4	28	259	5.9
4,000	30	207	1.0	30	272	6.6	30	279	3.0	30	297	1.3	30	296	4.4	29	247	3.9	26	254	9.1	29	348	1.0	30	99	4.5	30	262	9.3	30	293	4.7	30	279	10.5	28	263	7.3
5,000	29	219	.7	28	275	8.5	30	280	3.5	30	302	2.9	30	302	7.3	29	250	3.9	25	258	9.9	29	298	2.0	29	87	4.1	30	258	11.3	30	290	7.5	29	277	11.4	27	271	9.4
6,000	29	272	.9	28	282	9.1	30	301	3.8	30	305	3.4	29	297	8.6	29	247	5.6	25	260	11.8	28	270	2.5	29	77	3.5	30	260	13.4	30	285	8.6	27	275	13.8	27	270	10.5
8,000	29	306	2.1	21	295	12.3	28	277	5.7	29	277	4.5	26	286	8.6	28	245	8.0	23	257	15.0	28	264	5.1	29	316	1.1	29	253	18.3	29	292	10.5	25	270	16.5	23	287	12.0
10,000	29	297	3.3	10	278	12.1	27	283	9.3	29	255	5.3	25	290	9.8	27	241	10.5	18	248	13.9	25	273	8.3	28	282	3.1	23	250	21.1	29	279	11.6	20	269	19.8	18	283	15.4
12,000	29	308	5.2				26	281	12.1	24	268	6.4	19	250	11.5	22	242	9.6	11	221	9.4	21	270	13.5	27	280	7.7	18	244	21.3	26	282	13.7	15	272	23.2	10	273	16.8
14,000	29	343	7.1				24	295	11.2	19	310	10.2	14	282	9.9	17	244	11.8				11	300	12.5	23	283	11.5	15	263	17.5	22	293	12.9						
16,000	13	27	8.2				13	304	9.0																10	285	3.1				17	308	6.2						

Altitude (meters) m. s. l.	Tatoosh Island, Wash. (33 m.)		
	Observations	Direction	Speed
Surface	30	218	3.6
500	30	278	5.7
1,000	30	280	4.8
1,500	30	289	4.6
2,000	30	289	4.8
2,500	30	293	6.2
3,000	30	297	7.1
4,000	29	300	9.2
5,000	27	297	10.4
6,000	25	299	12.0
8,000	25	303	17.0
10,000	14	299	19.1
12,000	11	274	19.0

NOTE.—Resultants prepared from rawins at high altitudes are biased toward lower wind speeds. Values appearing in this table should therefore be used with caution when the number of observations missing is greater than three. See note following Table III in the June 1948 issue of the MONTHLY WEATHER REVIEW.

RIVER STAGES AND FLOODS FOR JUNE 1949

The most destructive flooding during June was due to flash floods in the Potomac and Arkansas River Basins and in the tributaries of the Upper Trinity. Several lives were lost and property, crop, and road damage was high. Severe flooding occurred on the Little and Upper Big Blue Rivers and on local reaches of the Solomon near Beloit, Kans. There was major flooding along the upper Arkansas in Kansas and record stages were reached at several points.

Atlantic Slope drainage.—Precipitation in the New England States was generally below normal except in local areas where heavy thundershowers occurred. It was an unusually dry month and was record breaking in some sections. No records for low stages, however, were established even though the streams remained below normal during most of the month. It was also extremely dry in the Delaware Basin. It was the driest June of record at Philadelphia, Pa., and the driest calendar month of record at Trenton, N. J.

Severe flash floods occurred in the South Branch of the Potomac in West Virginia, and in the North River, a tributary of the South Fork of the Shenandoah, in Virginia, during the night of the 17th and early morning of the 18th. The areas hardest hit were the Petersburg-Moorefield area on the South Branch and the Stokesville-Bridgewater, Va., area on the North River. The flood in the South Branch exceeded the great flood of March 1936 in the Petersburg-Moorefield area. At Springfield, W. Va., the crest of 29.8 feet was the highest stage reached at this point since March 1936 when a stage of 34.2 feet was reached. The crests flattened out as they moved downstream and only minor flooding occurred along the main stem of the Potomac at Harpers Ferry, W. Va., and near Washington, D. C. (Leiter gage). The highest stage reached in tidewater in the Washington area was 5.5 feet, 1.5 feet below flood stage at the Wisconsin Avenue gage on the 20th at high tide.

These flash floods were due to heavy to excessive rains that occurred in a relatively short period. At Brushy Run, W. Va., 7.84 inches of rain was measured in the 12-hour period ending at 7 p. m. on the 17th. During the 24-hour period ending the following morning 12.02 inches of rain had fallen at that point and 9.18 inches at Petersburg, W. Va. During the 4-day period from the 16th–19th, the rainfall at these two places totaled 14.26 and 12.66 inches, respectively. At Big Meadows, Va., 13.52 inches occurred during the same period. The rainfall over the South Branch during this period averaged 5.2 inches, over the Shenandoah, 4.6 inches, and over the entire Potomac basin, 3.6 inches.

At least 8 persons lost their lives in these flash floods with a score reported as missing. About 2,400 residents were driven from their homes. Several bridges and hundreds of homes and other buildings were damaged or destroyed. Several thousand head of cattle, sheep, and hogs were lost.

Heavy to excessive showers on the 29th caused flooding on the Roanoke and Neuse Rivers in Virginia and North Carolina. At Alta Vista, Va., the Roanoke rose to 11 feet above flood stage on the 30th. At Smithfield, N. C., the Neuse rose 11 feet during the night to 1.5 feet above flood stage. Record-breaking rainfall amounts occurred at Smithfield and Scotland Neck, 5.1 and 5.55 inches respectively, with the former receiving 4.69 inches in 75 minutes.

East Gulf of Mexico drainage.—Slight flooding occurred on the Pearl River at Pearl River, La., during the last 3 days of June due to excessive rain showers on the afternoons of the 23d and 24th.

Upper Mississippi Basin.—Light flooding occurred on the lower Des Moines at Eddyville and Ottumwa, Iowa, and on the Middle River at Indianola due to heavy local rains on the 24th and 25th. Precipitation was below normal during the first half of June, but scattered showers during the following 10 days supplied adequate soil moisture to cause slight rising trends on the lower Raccoon and on the Des Moines below the Raccoon before the heavy local rains occurred. No damage resulted from the flood as the only land affected was low-lying submarginal agricultural bottom land.

Ohio Basin.—Heavy rainfall (5 inches) along the Green and Barren Rivers on the 15th and 16th resulted in a minor flood on the former at Brownsville and Woodbury, Ky., and on the latter at Bowling Green, Ky.

Heavy rains on the mountain ridges of western North Carolina during the 72-hour period ending at 6 a. m. on the 17th caused severe headwater floods on several tributaries of the French Broad, Little Tennessee, Hiawassee and Nolichucky Rivers. The floods resulting from this storm caused severe crop and road damage but commercial, industrial, and residential damages were relatively light. The principal damage along the French Broad was confined to the reach above Asheville where flood waters inundated a considerable area of truck crops.

Excessive rainfall amounts on the upper reaches of the Little Tennessee River ranged from near 8.5 inches to about 4.5 inches at Bryson City and Franklin, N. C. Above Franklin the flood exceeded that of August 1940. Crop and road damages above this point were severe. On the Nantahala River, a headwater tributary of the Little Tennessee River, the flood above Rainbow Springs, N. C., was higher than any flood in the memory of the inhabitants. There was little damage on this reach due to lack of bottom land. On the Hiawassee River the flood was confined to the headwaters above Chatuga Dam. Portions of the Shorting Creek Basin had rainfall exceeding 10 inches. The flood on this creek was the most severe since shortly before 1900.

On the Pigeon River, a tributary of the French Broad, the rainfall was most intense over the East Fork, above Canton, N. C. The rainfall ranged from 6.7 inches in the lower areas up to 12.4 inches in the headwaters. Crop and road damages above Canton were severe.

On the Nolichucky River the flood was confined mainly to the two upper tributaries, the Cane and South Toe Rivers. Rainfall in this area ranged from about 12.8 inches on the highest ridges to 6 inches on the western limits of the basin. At Sioux, N. C., the Cane River was 2.2 feet below the flood of August 1940. At Cove River, N. C., it was about equal to the 1940 flood and at Riverside, N. C., it was greater. At Newdale, N. C., the South Toe was 3 feet under the August 1940 flood and in the headwaters it was about equal to it. Crop and road damages were heavy on the Cane River and somewhat less on the South Toe.

Missouri Basin.—Torrential rains on the 1st resulted in local flooding on the Elkhorn River at West Point, Nebr., from the 2d to the 4th. Damage from flood waters was confined mostly to railroad and highway embankments in the Hoskins-Norfolk-Stanton area on the 1st and to crop damage near West Point on the 3d and 4th.

Minor flooding occurred along Oak Creek in the vicinity of Raymond, Nebr., and along Salt Creek at Ashland, Nebr., due to heavy rain (1 to 2.5 inches) on the 13th.

No important damage resulted from the light overflows.

Severe flooding occurred along the Little Blue, Upper Big Blue and on local reaches of the Solomon near Beloit, Kans., during the month. Flood stages were exceeded by nearly 10 feet on the Solomon on two occasions, and on the Big Blue at Barnston, Nebr., with a slightly less overflow in Kansas at Blue Rapids. Minor overflows were recorded on the upper Republican in Nebraska, on the lower Solomon, the Delaware, and at Manhattan on the Kansas River. Heavy damage resulted from the flooding with the principal damage in the upper Little Blue Basin.

Flood stages were reached or exceeded at most points on the Missouri River at and below Rulo, Nebr., on the Grand at Chillicothe, Mo., and on several other smaller tributaries. The flooding was generally minor except along the Nemaha where heavy rains (4 to 6 inches) on the night of the 1st and 2d caused a rise of 24 feet at Falls City, Nebr. This stream overflowed three times in this area during June. A flash flood occurred on the Lamine river causing it to rise to 9 feet above bankfull stage at Clifton City, Mo., on the 7th for the 3d overflow in 7 days. This flash rise was followed by another flood on the night of the 10th. The Grand River rose 19 feet at Chillicothe, Mo., during the night of the 2d and 3d causing an overflow of 6 feet.

Arkansas Basin.—The Cimarron River at Perkins, Okla., overflowed slightly on two different occasions and minor overflows were also reported on Cow Creek in Kansas and on Big Cabin Creek in Oklahoma. There was major flooding along the upper Arkansas in Kansas and record stages were reached at Syracuse, Garden City, and Dodge City. This flood was similar to the one of April 1942. Heavy damages resulted from the severe flooding.

A flash flood occurred in the lower Arkansas Valley in the vicinity of Bristol, Lamar, and Holly, Colo., on the 4th due to torrential rains averaging nearly 7 inches. Damage in the valley to property and crops was high.

Another flash flood occurred on the afternoon of the 5th at Florence and Portland, Colo., following a cloudburst. A wall of water 10 feet above the flood stage roared into east Florence from Sand Creek which drains into Newlin Creek coal mining region to the south. It burst its banks at the Front Street bridge in south Florence and again at the point where Highway 50 crosses the creek near the Old Florence Continental Oil Refinery. The water caused heavy damage to buildings and homes in the Florence area. A short time later the highway was again closed when Hardscrabble Creek went on a rampage at Portland, a small town below Florence, putting the road beneath more than 4 feet of water. On Hollywood Flats the water was up to 7 feet deep, covering low buildings. Thirty-one homes were either swept away or upset, and homeless Portland residents were housed in an abandoned part of the cement plant.

Red Basin.—Scattered heavy showers (2.5 to 3 inches) over the extreme upper Sulphur Basin on the 13th and 14th resulted in light flooding at Hagansport, Tex. Minor flooding occurred on the Little River at Whitecliffs, Ark., from the 17th to the 19th due to the heavy rains (3 inches) on the 13th and 14th. Light flooding occurred on the Ouachita at Arkadelphia and Camden.

Atchafalaya Basin.—Light flooding occurred on the Atchafalaya at Morgan City, La., for almost 3 hours on the 25th due to tide and wind effects.

West Gulf of Mexico drainage.—Light flooding occurred in the Sabine River at Mineola, Tex., in the beginning of the month due to heavy rains (over 4 inches) on May 28 and 29.

Flood-producing rains occurred over the Elm Fork and East Fork drainage basins of the Upper Trinity watershed on the night of the 13th and 14th. The heaviest precipitation occurred in the vicinity of Carrollton, Richardson, and Garland, Tex. The overnight rainfall at Richardson totaled 11.81 inches and over the basin it averaged 2.1 inches. The flood at Garland, Tex., and nearby communities was similar to the severe flash flood of the previous month at Fort Worth, Tex. The heaviest loss from this flood occurred at Garland, Tex.; damage was also severe in other communities near the center of the heaviest precipitation.

A small flood occurred on the Nueces River at Cotulla, Tex., on the 12th due to heavy local rains (5 inches in Cotulla area). No damage resulted.

Heavy thundershowers on the afternoon of the 25th over the San Antonio, Tex., area caused the Salado Creek to overflow its banks and flood the city to depths of 15 to 18 inches. Unofficial rainfall measurements of 10 to 12 inches were reported from the southeast and south sides of the city. Damage to streets in southeastern San Antonio was heavy.

Flood stages were exceeded at various points on the Rio Grande between Alamosa, Colo., and Albuquerque, N. Mex., from the 11th to the end of the month. The high water was principally due to high level snow melt with crest stages considerably increased by heavy rains over the upper basin.

Flooding occurred on the San Juan (Animas) at Durango, Colo., throughout the month.

Columbia Basin.—The waters of the Snake River below American Falls, as well as those of the Salmon and Clearwater receded gradually from near bankfull stages during the latter half of May and throughout June. Heavy snow melt at their headwaters occasioned fairly high but no over-bankfull stages on the upper Snake and Henry's Fork.

The Willamette at Portland, Oreg., and the Columbia at Vancouver, Wash., receded gradually from the crest on May 18 throughout the remainder of May and June except for slight rises on May 23 and 29, and from June 8 to 11. The flood was due to an unseasonable warm period occurring simultaneously over the upper Columbia and Snake River Basins. Precipitation was unusually deficient in April and near or slightly below normal during May. Losses due to the flood were those mostly due to erosion and the flooding of pasture lands.

FLOOD STAGE REPORT FOR JUNE 1949

[All dates in June unless otherwise specified]

River and station	Flood stage	Above flood stages—dates		Crest [1]	
		From—	To—	Stage	Date
ATLANTIC SLOPE DRAINAGE					
South Branch Potomac: Springfield, W. Va.	15	18	19	29.8	18
Potomac:					
Harpers Ferry, W. Va.	18	19	19	18.5	19
Washington, D. C. (Leiter gage)	10	20	21	13.0	20
Roanoke: Alta Vista, Va.	10	30	(2)		
Neuse: Smithfield, N. C.	13	30	(2)		
EAST GULF OF MEXICO DRAINAGE					
Pearl: Pearl River, La.	12	28	30	12.2	29
MISSISSIPPI SYSTEM					
Upper Mississippi Basin					
Middle: Indianola, Iowa	14	25	25	15.5	25
Des Moines:					
Eddyville, Iowa	15	26	26	16.2	26
Ottumwa, Iowa	9	26	26	9.2	26

See footnotes at end of table.

FLOOD STAGE REPORT FOR JUNE 1949—Continued

[All dates in June unless otherwise specified]

River and station	Flood stage	Above flood stages—dates From—	Above flood stages—dates To—	Crest [1] Stage	Crest [1] Date
MISSISSIPPI SYSTEM—continued					
Missouri Basin					
Nemaha: Falls City, Nebr	20	2	3	28.4	2
		28	29	26.9	28
Tarkio: Fairfax, Mo	17	2	2	18.8	2
		28	28	19.8	28
One Hundred and Two: Maryville, Mo	14	1	2	15.7	1
Solomon:					
Kerwin, Kans	13	13	13	13.0	13
Alton, Kans	12	14	14	16.2	14
Beloit, Kans	18	8	12	27.9	11
		14	17	28.2	16
		20	21	21.7	21
Niles, Kans	24	15	15	24.2	15
		20	21	25.2	21
Republican:					
Norton, Kans	17	9	9	17.7	9
		18	18	18.6	18
Cambridge, Nebr	5	7	9	6.3	7
		10	11	5.2	11
		13	13	5.7	13
		17	19	7.1	17–18
Guide Rock, Nebr	10	9	9	11.7	9
		13	13	10.0	13
Hardy, Nebr	11	9	9	12.7	9
Scandia, Kans	10	9	9	11.5	9
		13	13	10.7	13
Concordia, Kans	10	9	9	10.4	9
Clay Center, Kans	15	10	11	18.6	10
		14	15	16.8	14
		28	29	17.5	28–29
Little Blue:				13.3	10
		9	15	12.0	11
				12.2	12
Endicott, Nebr	9			14.9	14
		28	28	9.4	28
		29	29	9.4	29
Hanover, Kans	14	10	11	16.2	10
		13	13	14.4	13
		14	16	19.0	15
		28	29	15.5	29
Big Blue:		10	11	22.0	10
Crete, Nebr	15	13	16	21.8	14
		24	24	18.0	24
		29	July 1	17.9	30
Beatrice, Nebr	16	16	16	16.8	16
Barnston, Nebr	18	17	17	18.1	17
		28	29	27.8	28
Blue Rapids, Kans	20	13	13	23.1	13
		15	16	23.5	15
		25	25	23.1	25
		28	29	29.2	29
Randolph, Kans	22	28	30	26.3	29
Delaware: Valley Falls, Kans	22	3	3	23.1	3
Stranger Creek: Tonganoxie, Kans	23	25	25	23.4	25
Kansas: Manhattan, Kans	17	11	11	17.4	11
		15	15	17.3	15
		29	30	18.1	29
Grand:					
Chillicothe, Mo	18	2	4	24.0	3
		14	15	24.6	14
Sumner, Mo	25	2	5	29.9	4
		14	17	28.9	15
Brunswick, Mo	12	3	6	16.6	5
		15	17	14.7	16
		26	30	13.9	30
Chariton: Novinger, Mo	19	1	1	20.6	1
		13	16	23.6	16
Lamine: Clifton City, Mo	15	24	30	20.9	29
		6	9	23.0	9
Blackwater: Blue Lick, Mo	25	14	15	16.3	14
Missouri:		7	14	30.6	9
Rulo, Nebr	17	2	3	18.3	2
		28	29	18.1	28
St. Joseph, Mo	17	2	3	17.5	3
		28	30	17.7	29
Atchison, Kans	20	2	4	21.3	3
		25	25	20.3	25
		29	30	21.5	29
Leavenworth, Kans	19	3	4	19.8	3
		29	30	20.2	29
Lexington, Mo	22	3	4	22.8	4
		15	15	22.1	15
		29	30	23.5	30
Waverly, Mo	18	3	5	20.3	4
		15	16	18.8	15
		26	27	18.8	26
		29	30	20.7	30
Boonville, Mo	21	5	5	21.4	5
		15	16	21.4	15
Hermann, Mo	21	4	7	22.7	5
		15	17	22.6	16
St. Charles, Mo	25	5	8	27.7	6
		15	18	27.2	17

FLOOD STAGE REPORT FOR JUNE 1949—Continued

[All dates in June unless otherwise specified]

River and station	Flood stage	Above flood stages—dates From—	Above flood stages—dates To—	Crest [1] Stage	Crest [1] Date
MISSISSIPPI SYSTEM—continued					
Ohio Basin					
Barren: Bowling Green, Ky	28	16	19	35.2	18
Green:					
Lock No. 6, Brownsville, Ky	28	19	20	29.6	20
Lock No. 4, Woodbury, Ky	33	17	22	39.1	20
Wabash: LaFayette, Ind	11	27	27	11.6	27
French Broad:					
Asheville, N. C	9	16	17	11.8	16
Marshall, N. C	10	16	17	11.7	17
South Chickamauga Creek: Chickamauga, Tenn	10	16	16	11.6	16
Arkansas River					
Cow Creek: Lyons, Kans	15	14	15	16.0	15
Cimarron: Perkins, Okla	11	7	7	11.1	7
		15	15	11.8	15
				21.7	May 19
Deep Fork: Dewar, Okla	18	May 18	20	22.8	May 22
				23.1	May 23
				22.6	12
North Canadian:		5	5	5.6	5
Woodward, Okla	5	10	10	5.2	10
		14	14	5.6	14
Canton, Okla	9	1	22	9.9	19
Arkansas:					
Syracuse, Kans	7	5	6	11.2	5
Garden City, Kans	7	5	7	9.4	7
Dodge City, Kans	10	7	9	13.3	8
Great Bend, Kans	8	8	18	10.1	13
Hutchinson, Kans	6	7	20	8.2	15–16
Arkansas City, Kans	16	8	8	16.7	8
		21	21	16.5	21
Fort Smith, Ark	22	12	12	22.2	12
		14	15	22.4	15
Van Buren, Ark	22	12	16	23.2	12
				23.4	15
Dardanelle, Ark	22	16	16	22.0	16
Red Basin					
Ouachita:					
Arkadelphia, Ark	17	15	16	20.4	15
Camden, Ark	26	18	19	26.5	19
Little:					
Horatio, Ark				30.5	15
Whitecliffs, Ark	25	17	19	26.1	18
Sulphur: Hagansport, Tex	38	14	15	39.8	15
Atchafalaya Basin					
Atchafalaya: Morgan City, La	6	25	25	6.2	25
WEST GULF OF MEXICO DRAINAGE					
Sabine:					
Mineola, Tex	14	2	5	15.8	4
Elm Fork: Carrollton, Tex	6	14	15	11.1	14
East Fork: Rockwall, Tex	10	14	16	14.1	14
Trinity:					
Dallas, Tex	28	14	17	36.0	15
Rosser, Tex	26	16	20	32.8	17
Trinidad, Tex	28	18	23	37.3	21
Long Lake, Tex	40	May 28	3	41.5	May 30
Liberty, Tex	24	5	12	24.6	9
Nueces: Cotulla, Tex	15	12	12	15.1	12
Rio Grande:					
Alamosa, Colo	9	17	26	10.6	20
Lobatos Bridge, Colo	4	13	(2)	7.7	21
Embudo, N. Mex	8	18	(2)	12.2	22
Espanola, N. Mex	7	18	29	8.1	23
		11	11	4.2	11
Albuquerque, N. Mex	4	19	19	4.4	19
		21	26	4.6	23
GULF OF CALIFORNIA DRAINAGE					
Colorado Basin					
Eagle: Eagle, Colo	5	13	20	5.1	20
Gunnison: Delta, Colo	11	18	19	11.6	18
Animas: Durango, Colo	4	May 23	(2)	5.5	May 28
				8.3	19
San Juan: Farmington, N. Mex	7	20	20	7.2	20
Colorado: Grand Junction, Colo	11	18	21	11.6	19
PACIFIC SLOPE DRAINAGE					
Columbia Basin					
Coeur d'Alene Lake: Coeur d'Alene, Idaho	30	May 1	May 31	34.5	May 17
Willamette: Portland, Oreg	18	May 14	13	22.2	May 18
Columbia: Vancouver, Wash	15	May 12	18	22.5	May 18

[1] Provisional.
[2] Continued at end of month.

CLIMATOLOGICAL DATA FOR JUNE 1949

CONDENSED CLIMATOLOGICAL SUMMARY OF TEMPERATURE AND PRECIPITATION BY SECTIONS

[For description of tables and charts, see REVIEW, January 1943, p. 15]

In the following table are given for the various sections of the climatological service of the Weather Bureau the monthly average temperature and total rainfall; the stations reporting the highest and lowest temperatures, with dates of occurrence; the stations reporting the greatest and least total precipitation; and other data as indicated by the several headings.

The mean temperature for each section, the highest and lowest temperatures, the average precipitation, and the greatest and least monthly amounts are found by using all trustworthy records available.

The mean departures from normal temperatures and precipitation are based only on records from stations that have 10 or more years of observations. Of course, the number of such records is smaller than the total number of stations.

As of January 1, 1949, dewpoint values below 32° F. and relative humidity values at temperatures below 32° F. are expressed with respect to water rather than with respect to ice, as used prior to that date. Therefore, these hygrometric values before and after January 1, 1949, cannot accurately be combined without necessary conversion.

Section	Temperature								Precipitation					
			Monthly extremes								Greatest monthly		Least monthly	
	Section average	Departure from the normal	Station	Highest	Date	Station	Lowest	Date	Section average	Departure from the normal	Station	Amount	Station	Amount
	°F.	°F.		°F.			°F.		In.	In.		In.		In.
Alabama	77.9	−0.3	Greensboro	98	30	3 stations	54	1 4	5.80	+1.53	Robertsdale	12.99	La Fayette	0.81
Arizona	74.5	−.2	7 stations	114	1 16	Maverick	21	2	.84	+.50	Bright Angel R. S.	3.13	12 stations	.00
Arkansas	77.9	+.8	Camden No. 1	101	24	Lead Hill	52	16	5.17	+1.05	Ft. Smith WTR Plant	11.06	Camden No. 1	1.67
California	71.3	+1.4	Greenland Ranch	122	15	2 stations	22	1 19	.06	−.24	Lake City	1.87	385 stations	.00
Colorado	61.0	−.6	2 stations	103	30	do	21	2	3.26	+1.79	Allens Park	8.26	Manassa	.32
Florida	79.8	−.1	do	99	6	Secotan	55	3	7.54	+.78	Punta Gorda	18.53	Carrabelle	2.29
Georgia	77.3	−1.3	5 stations	98	1 6	Blairsville Exp. Sta	42	5	5.10	+.62	Burton Dam	13.07	Norcross	1.63
Idaho	60.3	.0	Swan Falls	103	11	Obsidian	15	17	.65	−.68	Fenn Ranger Station	2.15	Buhl	.00
Illinois	74.7	+2.5	Harrisburg	104	30	Marengo	34	8	4.19	+.17	Fairfield	8.30	Virden	1.71
Indiana	74.7	+1.5	Kokomo Post Office	100	28	4 stations	40	1 8	5.36	+1.40	Paoli	12.72	Whiting	1.87
Iowa	72.4	+2.9	2 stations	99	1 20	Decorah	36	7	5.51	+.97	Tingley	11.51	Pocahontas	.99
Kansas	74.6	+.9	Elkhart	104	17	Goodland	42	2	5.93	+1.88	Horton	11.81	Elkhart	2.49
Kentucky	74.8	+.9	2 stations	97	1 11	Hindman Settlement School.	40	9	5.52	+1.34	St. John Bethlehem Acad.	12.04	Farmers	1.00
Louisiana	80.8	+.6	do	100	1 23	4 stations	60	1 4	5.20	+.47	Grand Isle	13.62	Rodessa	1.29
Maryland-Delaware	72.8	+1.4	Ocean City, Md	100	26	Oakland, Md	30	8	2.02	−1.90	Frostburg, Md	6.85	Ocean City, Md	.05
Michigan	68.6	+4.3	Baldwin State Forest	104	27	Cadillac CAA	18	8	4.17	+1.00	Hermansville	7.99	Yale	1.01
Minnesota	67.0	+2.3	Chaska, 1 NE	103	30	2 stations	28	7	4.08	−.06	Babbitt	7.32	Warroad	1.17
Mississippi	79.2	+.3	3 stations	98	1 8	do	56	17	5.51	+1.32	Lambert	13.36	Rosedale	1.36
Missouri	75.2	+1.6	St. Charles	99	30	Univ. of Kansas City	48	14	6.55	+1.72	Camdenton	13.82	St. Louis University	2.08
Montana	60.3	+.2	Lame Deer	103	11	Summit	18	18	1.71	−1.05	Adel	4.97	Lonepine, 1 WNW	.20
Nebraska	70.1	+.8	Scottsbluff	102	29	Bridgeport	34	2	4.92	+1.13	Falls City	15.38	Niobrara	1.32
Nevada	65.4	+1.2	Overton	114	16	Wilkins	22	17	.38	−.21	Caliente	1.70	8 stations	.00
New England	67.8	+3.8	Sandwich, Mass	98	26	Somerset, Vt	28	9	1.69	−1.83	Dixville Notch, N. H.	6.01	5 stations	.00
New Jersey	72.1	+3.0	Runyon	102	25	2 stations	33	9	.23	−3.60	Glassboro	1.10	4 stations	.00
New Mexico	68.9	+1.3	3 stations	105	1 17	Gavilan	20	2	2.10	+.85	Endee	10.79	3 stations	.00
New York	70.1	+4.9	2 stations	99	1 14	2 stations	27	8	1.47	−2.18	Cortland	5.64	4 stations	.00
North Carolina	75.2	+.8	4 stations	100	1 26	do	37	1 4	6.26	+1.32	Hatteras WB	20.95	Randleman	1.32
North Dakota	63.7	+.9	Dunn Center	104	12	Grenora	24	24	2.63	−.88	Upham Wildlife Refuge.	5.98	Trotters	.18
Ohio	73.5	+3.8	Ironton	98	24	Zanesville CAA	29	5	4.22	+.25	Xenia, 2 N	8.55	Cleveland WB City	.88
Oklahoma	78.0	+.7	3 stations	102	1 20	Kenton	41	2	4.98	+.97	Okmulgee	13.01	Hennessey	.92
Oregon	60.2	+.4	The Dalles	103	6	Chemult	18	1 2	.51	−.97	Astoria	3.15	5 stations	.00
Pennsylvania	70.7	+2.5	2 stations	100	26	Kane, 1 NNE	24	8	1.92	−2.22	Hyndman	6.22	Philadelphia Pt. Breeze.	.05
South Carolina	77.1	−.7	4 stations	90	1 11	4 stations	50	1 2	4.26	−.43	Ridgeland	10.01	Winnsboro	.90
South Dakota	67.5	+1.4	Hilland, 4 W	104	26	Hardy R. S	28	4	2.00	−1.60	Deerfield Dam	4.29	Lemmon	.21
Tennessee	75.5	+.7	Memphis WBAS	97	30	Greeneville Exp. Sta	46	4	7.01	+2.76	Locks No. 5, Cumb. Rvr.	14.51	Mountain City	1.75
Texas	79.8	−.4	Presidio	111	17	Dalhart Exp. Sta	45	2	3.23	+.24	San Antonio Nursery	11.19	Bakersfield	.19
Utah	63.4	−1.3	St. George CAA	104	1 15	Scofield Dam	22	1	1.47	+.79	Bryce Canyon Ap	4.17	2 stations	.00
Virginia	72.8	+.9	Newport News	101	27	3 stations	37	1 3	4.72	+.56	Big Meadows	17.13	Cardinal	1.10
Washington	59.9	−.6	Richland, 2 NW	103	7	2 stations	24	1 3	.78	−.95	Mt. Baker Lodge	6.35	4 stations	.00
West Virginia	71.6	+1.8	2 stations	97	25	Cranberry Glades	25	9	5.82	+1.34	Petersburg WB City	17.15	Davisson Run	.61
Wisconsin	69.1	+4.0	do	99	30	Land O'Lakes	23	8	4.99	+.80	Baraboo Waterworks	10.65	Chilton Sewage Plant	2.29
Wyoming	58.5	.0	Midwest	97	29	Tower Falls	21	1 27	2.14	+.40	Fox Park	6.01	Riverton	.66
Alaska (May)	37.1	−4.3	Mile 28 (Haines Hy)	79	22	Umiat	−21	1	1.40	−.21	Annex Creek	15.50	Matanuska Valley No. 14.	.03
Hawaii	72.2	−.8	Kaanapali	90	1 5	Haleakala R. S	38	5	2.89	−2.20	Kahana	15.20	Waiopai Ranch	.00
Puerto Rico	78.3	.0	3 stations	95	1 1	Garzas	54	15	6.38	+.42	Rio Blanco 1800 [1]	13.92	Barceloneta	2.08

[1] Other dates also.

CLIMATOLOGICAL DATA FOR WEATHER BUREAU STATIONS FOR JUNE 1949

District and station	Elevation of instruments: Barometer above sea level [1]	Elevation of instruments: Thermometer above ground	Elevation of instruments: Anemometer above ground	Pressure: Station	Pressure: Sea level	Pressure: Departure from normal	Temperature of the air: Averages: Mean maximum	Temperature of the air: Averages: Mean minimum	Temperature of the air: Averages: Mean	Temperature of the air: Averages: Departure from normal	Temperature of the air: Extremes: Highest	Temperature of the air: Extremes: Date	Temperature of the air: Extremes: Lowest	Temperature of the air: Extremes: Date	Total heating degree days	Mean temperature of the dew-point	Mean relative humidity [6]	Precipitation: Total	Precipitation: Departure from normal	Precipitation: Greatest in 24 hours	Precipitation: Days with 0.01 inch or more	Precipitation: Days with thunderstorms	Precipitation: Total snowfall (unmelted)	Precipitation: Snow, sleet, and ice on ground at end of month	Wind: Average hourly speed	Wind: Prevailing direction	Wind: Speed of fastest mile: Miles per hour	Wind: Speed of fastest mile: Direction	Wind: Speed of fastest mile: Date	Character of day (sunrise to sunset), number of days: Clear	Character of day (sunrise to sunset), number of days: Partly cloudy	Character of day (sunrise to sunset), number of days: Cloudy	Sky cover [7] tenths (sunrise to sunset)	Possible sunshine
NEW ENGLAND	*Ft.*	*Ft.*	*Ft.*	*Mbs.*	*Mbs.*	*Mbs.*	°F.	°F.	°F.	°F.	°F.		°F.			°F.	%	*In.*	*In.*	*In.*			*In.*	*In.*	*m. p. h.*					*0–3*	*4–7*	*8–10*	*0–10*	%
Caribou [2]	628	5	33	991.5	1,014.5	.....	74	51	66.0 62.8	+5.0 +4.9	91	13	35	1	156	53	70 72	1.53 3.82	−1.8 −.1	1.63	14	5	.0	0	11.1	.....	.....	.....	.....	2	12	16	5.4 7.3	...
Eastport	75	67	82	1,012.9	1,015.6	+2.4	69	49	59.0	+3.9	82	19	42	1	188	.....	...	1.58	−1.4	.61	8	6	.0	0	8.8	.....	22	e.	15	4	16	10	6.3	62
Portland, Maine [3]	103	6	43	1,012.9	1,016.1	+2.2	76	53	64.7	+5.1	89	26	40	8	86	56	76	2.05	−1.2	.94	6	5	T	0	6.7	.....	31	s.	10	12	8	10	5.1	60
Concord [2]	289	5	45	1,005.8	1,016.5	+2.6	83	54	68.4	+6.7	93	21	35	1	52	55	66	1.51	−1.7	.65	4	5	.0	0	6.8	.....	27	w.	26	11	12	7	5.1	70
Mt. Washington	6,274	5	37	811.4	1,022.0	.....	55	43	49.1	.....	66	15	22	8	481	.....	...	6.38	+.1	1.34	13	5	1.4	0	26.5	.....	.....	.....	.....	4	9	17	7.3	34
Burlington [2]	403	6	51	1,000.7	1,015.1	+2.9	83	60	71.9	+6.2	94	13	40	1	44	59	66	1.09	−2.3	.37	8	4	.0	0	9.6	.....	35	nw.	22	5	14	11	5.9	61
Boston [2]	124	33	62	1,012.5	1,017.2	+3.7	82	61	71.6	+5.1	95	21	51	8	20	57	64	.93	−2.0	.69	4	2	.0	0	12.0	.....	33	ne.	27	12	11	7	4.6	65
Nantucket [2]	12	4	34	1,017.6	1,018.3	+4.4	73	58	65.0	+4.0	84	22	44	2	75	60	84	.01	−2.7	.01	1	0	.0	0	10.0	.....	27	sw.	12	17	5	8	4.3	72
Block Island	26	11	46	1,016.9	1,018.0	+4.1	73	60	66.4	+4.6	85	26	49	2	53	.....	...	T	−2.6	T	0	0	.0	0	12.5	.....	34	w.	26	15	9	6	4.3	92
Providence [2]	159	65	60	1,011.9	1,017.7	+3.8	83	61	72.0	+3.7	95	21	49	9	17	58	70	.04	−2.6	.04	1	2	.0	0	85	.....	29	nw.	26	15	9	6	4.3	84
Hartford [2]	159	5	44	1,011.9	1,017.6	+3.7	83	60	71.3	+4.2	92	27	45	9	20	59	69	.87	−2.2	.45	3	4	T	0	10.2	.....	26	se.	27	9	12	9	5.5	82
New Haven [2]	107	5	39	1,013.9	1,017.7	+3.5	79	60	69.7	+6.4	92	26	46	9	34	60	67	.12	−2.7	.06	4	2	.0	0	6.3	.....	18	se.	17	13	11	6	4.7	78
MIDDLE ATLANTIC																																		
Albany [2]	97	6	40	1,012.2	1,016.0	+2.5	84	60	73.6 72.0	+3.3 +5.3	94	12	38	9	34	58	68 63	1.68 1.69	−2.0 −1.4	1.09	4	2	.0	0	9.2	.....	35	nw.	26	8	17	5	5.7 5.1	82
Binghamton [4]	871	57	79	986.8	1,016.8	+2.6	84	60	71.7	+6.1	92	21	37	9	37	59	69	.71	−2.7	.40	5	3	.0	0	5.9	.....	18	w.	7	5	13	12	6.2	74
New York [4]	314	415	454	1,006.4	1,018.0	+3.8	80	65	72.6	+3.8	94	26	51	8	9	59	65	.16	−3.2	.14	2	0	.0	0	12.8	.....	40	w.	26	11	12	7	4.8	72
Allentown [2]	385	4	58	1,003.7	1,017.8	.....	86	60	72.3	+3.4	97	21	43	9	13	60	67	.34	−3.7	.29	4	0	.0	0	7.1	.....	.....	.....	.....	10	11	9	5.3	...
Harrisburg [2]	374	30	49	1,003.4	1,017.1	+1.5	84	63	73.4	+3.1	93	21	45	9	10	59	65	1.09	−2.5	.56	8	3	.0	0	7.6	.....	26	w.	26	9	9	12	5.9	75
Philadelphia [4]	114	174	150	1,013.9	1,017.4	+2.8	83	66	74.6	+3.2	95	26	55	8	1	61	68	.30	−2.9	.19	4	0	.0	0	7.8	.....	30	se.	17	8	13	9	5.7	72
Reading	323	47	306	1,005.8	1,017.3	+2.7	84	64	74.2	+3.9	95	21	48	9	6	.....	...	1.23	−2.3	.48	6	3	.0	0	10.8	.....	41	n.	26	8	9	13	5.8	75
Scranton	805	72	104	988.5	1,017.3	+2.7	84	62	72.8	+5.0	92	21	42	9	21	.....	...	1.64	−2.0	1.52	4	3	.0	0	6.2	.....	20	nw.	22	10	15	5	4.7	58
Atlantic City	52	37	172	1,015.6	1,017.3	+2.7	76	66	71.0	+4.4	95	26	54	19	18	.....	...	.36	−2.9	.16	4	2	.0	0	15.2	.....	34	n.	22	8	13	9	5.2	75
Newark [2]	30	5	46	1,016.3	1,017.6	.....	84	63	73.6	+3.7	99	21	51	8	10	59	65	.07	−3.8	.06	2	0	.0	0	10.6	.....	.....	.....	.....	11	12	7	4.8	...
Trenton	190	89	107	1,010.5	1,017.3	+3.1	83	63	73.0	+3.5	95	26	51	9	10	63	69	.06	−3.0	.03	3	1	.0	0	9.0	.....	25	sw.	25	9	12	9	5.3	74
Baltimore [4]	123	100	215	1,012.9	1,017.5	+2.9	84	68	75.6	+2.9	96	21	56	9	0	63	69	1.19	−2.7	.46	6	2	.0	0	10.8	.....	36	nw.	21	9	11	10	5.4	65
Washington [4]	112	56	100	1,012.9	1,017.2	+2.6	85	67	75.8	+3.6	95	26	50	9	0	62	67	1.85	−2.3	.70	8	1	.0	0	6.8	.....	22	se.	16	6	12	12	6.5	61
Cape Henry	18	8	54	1,015.9	1,016.6	+1.7	80	68	74.0	+1.1	95	26	52	9	4	.....	...	2.09	−1.9	1.06	10	7	.0	0	12.7	.....	32	ne.	2	8	13	9	5.7	62
Lynchburg [2]	686	5	58	983.4	1,016.8	+1.6	84	64	73.7	+.6	93	26	49	3	2	62	71	8.50	+4.7	3.23	11	6	.0	0	7.1	.....	38	se.	15	8	8	14	6.2	64
Norfolk [4]	91	80	125	1,013.4	1,017.0	+1.4	83	69	75.8	+1.4	98	26	57	9	0	66	77	2.57	−1.6	.76	11	5	.0	0	9.6	.....	29	ne.	2	4	11	15	7.0	68
Richmond [4]	144	11	52	1,010.5	1,016.4	+1.2	85	66	75.4	+1.3	97	27	51	9	1	64	74	4.65	+.8	3.07	13	8	.0	0	6.6	.....	26	se.	12	6	10	14	6.6	68
SOUTH ATLANTIC																																		
Asheville	2,253	77	92	.....	1,016.4	+.5	82	61	77.2 71.9	+1.0 +3.2	90	26	49	4	3	62	75 ...	5.62 4.19	+1.0 +.3	2.21	14	5	.0	0	6.7	nnw.	26	se.	15	3	11	16	6.7 7.0	68
Charlotte [4]	779	63	86	988.8	1,016.3	+.7	87	69	77.9	+2.4	95	27	55	2	0	64	68	2.62	−1.6	1.86	7	6	.0	0	6.8	e.	20	sw.	21	5	11	14	6.7	64
Greensboro [2]	886	6	56	985.4	1,016.8	+1.2	86	65	75.7	+1.7	96	26	49	3	1	63	70	1.89	−3.0	.45	10	5	.0	0	9.6	ne.	24	ne.	2	6	11	13	6.2	65
Hatteras	11	5	47	1,015.6	1,016.3	+.7	81	72	76.4	+.8	90	27	65	2	0	72	86	20.95	+16.4	14.73	12	6	.0	0	12.9	sw.	34	w.	7	6	10	14	6.8	64
Raleigh [4]	376	5	71	1,000.7	1,016.6	+1.4	86	67	76.7	+1.0	99	26	52	2	0	65	75	5.61	+1.2	2.85	17	7	.0	0	7.2	nne.	22	se.	15	3	20	7	5.8	43
Wilmington	72	73	107	1,014.6	1,016.1	+.2	84	70	77.0	+.2	94	27	59	2	0	70	...	6.13	+1.0	2.25	16	12	.0	0	9.5	ne.	30	nw.	21	2	15	13	7.0	55
Charleston [4]	48	11	92	1,013.9	1,015.4	−.5	85	72	78.6	−.3	95	28	60	2	0	70	82	4.12	−.5	1.07	18	10	.0	0	10.2	s.	33	e.	15	3	11	16	7.2	61
Columbia, S. C. [4]	347	70	91	1,003.4	1,015.6	.0	87	69	78.1	.0	95	28	60	3	0	67	72	1.29	−2.9	.39	10	7	.0	0	7.9	sw.	26	s.	24	6	9	15	6.7	62
Greenville, S. C. [3]	1,040	18	36	979.3	1,016.0	+.8	85	67	76.0	+1.9	93	27	58	3	0	64	71	3.93	−.6	1.59	12	10	.0	0	7.5	ne.	32	nw.	6	7	10	13	6.4	61
Augusta [4]	182	62	77	1,000.7	1,015.8	+.6	88	69	78.6	−.1	96	27	60	2	0	66	71	5.94	+1.3	2.28	12	7	.0	0	5.6	sw.	23	s.	8	5	12	13	6.5	71
Savannah [3]	65	19	51	1,013.5	1,015.6	−.3	87	71	79.0	+.8	96	28	60	2	0	69	77	7.60	+2.3	2.95	16	10	.0	0	10.9	sw.	29	n.	3	3	11	16	7.0	58
Jacksonville [4]	43	86	110	1,014.6	1,016.0	−.3	88	72	80.2	+.3	95	6	66	2	0	70	76	3.17	−2.2	.58	17	11	.0	0	7.9	sw.	23	s.	25	4	9	17	7.0	50
FLORIDA PENINSULA																																		
Key West [4]	21	10	64	1,014.9	1,015.9	+.3	88	78	81.0 82.8	+.3 +.9	90	22	72	11	0	73	76 74	6.39 4.68	+.1 +.4	1.79	18	9	.0	0	7.9	e.	25	se.	11	2	21	7	6.1 6.0	62
Miami [4]	25	242	249	1,014.9	1,015.8	−.8	85	74	79.5	−.5	87	1	67	1	0	71	78	6.90	−.3	1.66	16	17	.0	0	10.9	se.	31	sw.	1	4	17	9	5.8	63
Tampa [2]	35	5	36	1,014.6	1,016.0	+.1	90	72	80.6	+.4	94	27	64	3	0	71	77	7.59	+.3	1.54	16	16	.0	0	6.7	w.	23	w.	1	6	8	16	6.6	58
EAST GULF																																		
Atlanta [2]	1,173	33	72	975.3	1,015.8	+.2	85	67	79.2 76.2	+.3 −.5	92	7	61	4	0	65	76 74	6.28 4.80	+1.9 +.9	1.39	12	9	.0	0	7.8	ene.	38	nw.	25	5	13	12	6.3 6.3	48
Macon [4]	370	79	87	1,008.1	1,015.7	+.1	88	68	77.8	−1.1	95	29	55	4	0	66	70	1.46	−2.6	.18	12	11	.0	0	5.8	ne.	23	s.	8	4	10	16	6.9	61
Apalachicola	35	11	51	1,014.6	1,015.9	.0	86	73	79.4	−.4	92	30	66	3	0	.....	...	11.63	+6.0	5.34	12	9	.0	0	7.1	.....	28	n.	7	6	9	15	6.7	63
Pensacola [4]	56	54	79	1,013.5	1,015.5	−.1	87	74	80.3	+1.0	96	29	67	3	0	71	...	11.33	+6.6	5.10	14	16	.0	0	6.7	ssw.	25	nw.	24	6	8	16	7.0	62
Anniston	618	6	32	993.9	1,015.9	.0	87	66	76.4	.....	92	8	57	4	0	68	80	4.79	+.7	1.33	14	13	.0	0	4.5	e.	.....	.....	.....	7	12	11	7.3	...
Birmingham [2]	700	5	63	993.6	1,015.7	−.2	87	68	77.2	+.4	93	28	61	2	0	68	77	2.84	−1.6	.73	15	12	.0	0	7.0	sse.	32	ne.	5	4	12	14	7.0	48
Mobile [4]	57	86	161	1,007.5	1,015.5	−.1	89	73	80.8	+.5	97	29	66	3	0	70	77	9.85	+4.4	2.46	14	10	.0	0	9.8	s.	32	sw.	30	6	16	8	5.6	61
Montgomery [4]	218	92	105	1,008.1	1,015.4	−.2	88	71	79.1	−.5	94	7	65	2	0	68	76	9.10	+5.3	2.51	14	10	.0	0	6.1	s.	25	sw.	12	5	11	14	6.2	61
Meridian [4]	375	67	92	1,004.4	1,015.3	+.1	90	68	79.3	+1.2	95	23	58	17	0	69	78	6.16	+1.6	1.56	12	12	.0	0	5.3	s.	.....	.....	.....	8	9	13	6.1	...
Vicksburg [4]	247	82	102	1,005.8	1,014.6	−.6	88	71	79.8	+.8	93	29	66	17	0	70	...	3.75	−.2	.98	12	12	.0	0	7.0	se.	32	ne.	1	7	11	12	5.8	70
New Orleans C. O	53	76	84	1,013.2	.....	.....	90	75	82.4	+1.8	95	29	66	1	0	.....	...	5.31	−.6	1.23	14	14	.0	0	5.4	se.	27	e.	1	8	16	6	5.1	64
New Orleans A. P. [2]	30	6	52	1,013.2	1,014.9	−.3	90	72	81.4	.....	96	30	66	3	0	71	75	4.37	.....	2.21	9	15	.0	0	7.6	s.	40	nne.	1	8	16	6	5.2	...

See footnotes at end of table.

CLIMATOLOGICAL DATA FOR WEATHER BUREAU STATIONS FOR JUNE 1949—Continued

District and station	Elevation of instruments: Barometer above sea level [1]	Elevation of instruments: Thermometer above ground	Elevation of instruments: Anemometer above ground	Pressure: Station	Pressure: Sea level	Pressure: Departure from normal	Temperature of the air: Averages: Mean maximum	Temperature of the air: Averages: Mean minimum	Temperature of the air: Averages: Mean	Temperature of the air: Averages: Departure from normal	Temperature of the air: Extremes: Highest	Temperature of the air: Extremes: Date	Temperature of the air: Extremes: Lowest	Temperature of the air: Extremes: Date	Total heating degree days	Mean temperature of the dew-point	Mean relative humidity [6]	Precipitation: Total	Precipitation: Departure from normal	Precipitation: Greatest in 24 hours	Precipitation: Days with 0.01 inch or more	Precipitation: Days with thunderstorms	Precipitation: Total snowfall (unmelted)	Precipitation: Snow, sleet, and ice on ground at end of month	Wind: Average hourly speed	Wind: Prevailing direction	Wind: Speed of fastest mile: Miles per hour	Wind: Speed of fastest mile: Direction	Wind: Speed of fastest mile: Date	Character of day (sunrise to sunset), number of days: Clear	Character of day (sunrise to sunset), number of days: Partly cloudy	Character of day (sunrise to sunset), number of days: Cloudy	Sky cover [7] tenths (sunrise to sunset)	Possible sunshine
	Ft.	*Ft.*	*Ft.*	*Mbs.*	*Mbs.*	*Mbs.*	°F.	°F.	°F.	°F.	°F.		°F.			°F.	%	*In.*	*In.*	*In.*			*In.*	*In.*	m. p. h.					0-3	4-7	8-10	0-10	%
WEST GULF									82.2	+1.8							73	3.43	.0															5.4	
Shreveport [2]	181	5	64	1,005.1	1,013.8	−.4	92	72	81.8	+1.3	99	22	66	7	0	72	75	2.16	−1.3	.96	9	10	T	0	7.5	se.	50	e.	7	10	9	11	5.5	67
Fort Smith [2]	463	6	30	996.6	1,012.5	−.7	89	69	79.4	+1.9	97	22	61	16	0	69	75	2.86	−.9	.74	13	14	.0	0	5.9	ene.	35	w.	13	5	10	15	6.5	68
Little Rock [2]	265	26	58	1,001.7	1,014.1	−.1	89	70	79.5	+2.1	95	30	63	17	0	70	78	5.71	+2.0	1.60	12	14	.0	0	6.4	sw.	37	sw.	26	5	8	17	6.6	55
Austin [3]	621	5	41	991.5	1,013.0	+.5	92	70	81.0	−.2	97	22	63	6	0	69	71	3.52	+1.1	1.43	9	11	.0	0	8.3	se.	31	sw.	27	11	12	7	4.8	70
Brownsville [2]	20	5	54	1,009.1	1,011.5	−.4	92	77	84.2	+1.8	95	23	71	9	0	74	75	1.77	−1.4	1.03	3	3	.0	0	12.5	se.	36	se.	26	6	17	7	5.3	70
Corpus Christi [3]	44	6	33	1,011.5	1,012.8	−.4	93	75	83.9	+4.4	97	15	66	9	0	74	77	1.11	−1.5	.80	4	3	.0	0	12.3	sse.	36	s.	26	11	14	5	4.9	81
Dallas [2]	488	34	45	994.6	1,012.6	+.1	92	72	82.0	+1.6	100	21	65	13	0	61	67	4.91	+1.0	2.92	8	7	.0	0	9.7	s.	40	se.	13	11	9	10	5.1	73
Fort Worth [2]	706	40	56	987.5	1,012.4	−.1	92	72	82.2	+2.3	98	22	68	16	0	67	64	3.52	+.2	2.67	9	7	T	0	13.5	sse.	42	wnw.	14	12	9	9	4.6	--
Galveston [4]	54	122	129	1,013.5	1,014.1	−.1	86	79	82.5	+1.8	89	30	70	9	0	74	76	3.54	−.8	1.81	5	4	.0	0	11.9	s.	30	s.	25	12	8	10	5.1	86
Houston [4]	138	157	190	1,010.8	1,013.4	−.5	91	75	83.0	+1.6	96	23	68	8	0	72	75	1.19	−3.4	.67	6	7	.0	0	9.5	s.	34	n.	23	10	9	11	5.5	67
Laredo [2]	418	10	38	995.6	1,010.5	------	98	75	86.2	+.8	109	24	63	9	0	70	63	4.21	+2.3	2.58	2	6	.0	0	14.7	se.	----	----	----	10	13	7	5.2	--
Palestine	510	64	72	995.6	------	------	89	72	80.6	+1.6	95	22	66	16	0	----	--	1.46	−2.2	.55	7	6	.0	0	6.8	s.	34	nw.	14	10	12	8	5.3	70
Port Arthur [4]	34	59	134	1,012.9	1,013.7	−.5	91	76	83.2	+2.2	95	19	68	9	0	73	78	3.75	−1.0	1.79	9	11	.0	0	11.9	s.	35	s.	10	11	12	7	5.1	73
San Antonio [2]	794	6	51	988.2	1,012.6	+.1	91	71	81.0	------	99	24	61	7	0	69	71	8.26	+5.8	2.76	13	12	.0	0	9.1	se.	38	se.	15	6	17	7	5.6	69
OHIO VALLEY AND TENNESSEE									75.2	+2.9							73	5.64	+1.7															6.4	
Chattanooga [2]	762	6	66	991.5	1,015.5	+.3	87	67	77.0	+3.8	94	23	57	4	0	67	77	9.40	+5.2	4.85	15	16	.0	0	4.0	s.	62	ne.	5	5	10	15	6.5	59
Knoxville [2]	995	27	71	981.4	1,015.8	+.6	87	66	76.5	+2.7	94	23	56	4	0	65	73	3.22	−.9	1.71	11	6	.0	0	6.2	sw.	36	sw.	27	6	9	15	6.5	69
Memphis [4]	399	5	49	1,000.4	1,014.2	−.4	86	70	78.4	+.8	95	30	63	16	0	69	77	10.30	+6.8	4.58	17	17	.0	0	6.7	s.	40	sw.	14	4	12	14	6.6	69
Nashville [2]	546	5	72	995.3	1,014.9	−.7	86	67	76.7	+1.1	93	30	60	17	0	67	77	7.16	+3.2	3.39	15	14	.0	0	5.3	sse.	34	nw.	26	3	14	13	6.6	55
Lexington [2]	989	4	58	980.6	1,015.7	−.2	86	65	75.3	+3.1	92	24	52	9	1	63	70	4.97	+.9	3.29	9	7	.0	0	8.1	ssw.	----	----	----	6	10	14	6.2	--
Louisville [2]	525	5	54	997.0	1,014.7	−.5	87	65	75.6	+2.1	94	30	53	9	0	65	72	6.78	+3.0	2.38	16	8	.0	0	6.2	sse.	38	s.	24	2	13	15	6.9	67
Evansville [2]	431	6	40	999.3	1,014.8	−.1	85	66	75.6	+3.7	93	28	56	6	0	66	76	4.81	+.8	.92	17	12	.0	0	7.9	s.	56	s.	24	6	6	18	7.2	61
Indianapolis [2]	823	5	54	985.8	1,014.7	+.1	84	63	73.4	+3.5	92	26	47	9	4	63	73	4.18	+.6	1.42	12	5	.0	0	7.6	s.	40	nw.	3	6	9	15	6.4	65
Terre Haute [2]	575	4	36	993.6	1,014.5	+.6	85	64	74.6	+2.6	95	30	50	8	2	64	74	7.54	+3.6	3.83	15	7	.0	0	8.9	sse.	33	n.	28	6	8	16	7.0	66
Cincinnati [4]	627	135	148	984.1	1,015.4	+.5	87	67	77.1	+3.4	96	28	52	9	1	62	70	6.78	+3.1	2.21	12	6	.0	0	3.9	s.	17	w.	26	7	9	14	6.1	73
Columbus [4]	822	90	110	986.1	1,015.6	+.7	86	66	76.0	+5.1	94	24	48	8	7	63	71	4.47	+1.2	1.07	13	6	.0	0	8.1	se.	32	s.	14	13	9	8	5.0	79
Dayton [2]	1,003	6	55	979.7	1,015.4	+1.2	84	64	73.8	+2.2	92	28	47	8	5	61	68	4.78	+1.0	1.76	13	8	.0	0	9.2	s.	41	s.	14	6	12	12	6.1	73
Elkins [2]	1,947	5	45	941.1	1,017.0	+1.4	81	56	68.3	+2.7	90	24	36	9	40	59	74	3.06	−2.0	.87	12	8	.0	0	5.8	------	26	se.	15	6	8	16	6.7	62
Parkersburg	637	77	84	----	----	----	86	64	74.8	+3.4	93	24	47	8	6	----	--	3.45	−.6	1.35	11	9	.0	0	5.6	------	20	se.	15	13	10	7	4.6	73
Pittsburgh [2]	842	39	54	986.1	1,016.3	+1.4	84	65	74.6	+3.9	95	24	44	8	11	59	66	3.64	−.2	1.60	12	6	.0	0	8.9	------	29	s.	15	7	12	11	5.7	66
LOWER LAKES									72.9	+6.9							66	2.02	−1.3															5.0	
Buffalo [2]	768	34	96	988.2	1,015.7	+1.5	83	61	72.2	+7.3	92	24	38	8	39	58	63	1.17	−1.6	.46	7	5	.0	0	12.1	------	36	sw.	6	10	14	6	4.9	86
Canton	448	10	61	998.6	1,014.6	+1.7	81	59	70.0	+6.5	91	16	39	8	55	57	65	3.21	−.1	1.53	7	6	.0	0	6.8	------	25	sw.	21	6	13	11	5.7	64
Oswego	335	71	85	1,003.1	1,015.2	+1.7	80	63	71.2	+8.3	93	24	45	9	55	----	--	.50	−2.8	.24	4	4	.0	0	7.8	------	29	n.	7	13	16	1	3.6	84
Rochester [2]	523	4	69	999.6	1,015.6	+1.4	86	60	73.0	+6.9	96	24	35	8	49	58	62	1.41	−1.6	.71	4	2	.0	0	8.6	------	61	sw.	21	10	16	4	4.7	76
Syracuse [2]	596	5	57	994.6	1,015.9	+1.7	85	61	73.2	+8.7	94	13	39	1	37	58	60	3.08	−.8	1.62	5	4	.0	0	8.1	------	35	s.	20	13	12	5	4.7	82
Erie [4]	714	57	81	----	----	----	81	65	73.2	+7.0	92	24	46	8	30	----	--	1.21	−2.1	.58	6	5	.0	0	6.9	------	22	se.	16	17	9	4	3.8	64
Cleveland [2]	762	27	54	988.2	1,015.5	+.9	85	63	73.9	+6.2	96	28	41	9	26	61	67	1.63	−1.5	.47	6	7	.0	0	9.5	s.	30	sw.	25	9	13	8	5.3	76
Sandusky	629	5	67	993.2	------	------	84	66	74.9	+6.1	94	24	50	9	20	----	--	1.45	−2.0	.71	8	4	.0	0	7.2	------	23	sw.	14	11	9	10	4.9	90
Toledo [2]	628	5	47	992.2	1,014.9	+.3	85	63	74.1	+6.9	96	28	43	9	23	61	69	1.39	−1.9	.88	8	5	.0	8	8.8	sw.	36	s.	14	5	16	9	6.0	79
Fort Wayne [2]	857	5	34	985.1	1,014.7	+.1	83	62	72.7	+5.3	93	30	43	9	19	62	73	5.37	+1.8	1.63	14	7	.0	0	7.0	s.	36	s.	14	6	12	12	6.1	69
Detroit [2]	730	5	77	992.9	1,015.3	+.7	84	63	73.3	+7.1	93	26	39	8	31	60	66	1.85	−1.7	.83	8	5	.0	0	8.9	s.	34	wnw.	25	10	13	7	5.2	70
UPPER LAKES									67.6	+5.2							71	3.90	+.5															5.7	
Alpena	609	5	89	992.2	------	------	74	56	64.8	+4.4	90	11	34	8	100	----	--	2.52	−.8	.98	10	4	.0	0	9.0	------	33	se.	12	8	11	11	5.5	67
Escanaba	612	51	72	991.5	------	------	72	56	64.4	+3.7	85	26	34	8	89	----	--	3.73	+.5	1.03	12	6	T	0	9.7	------	39	n.	6	9	16	5	5.2	75
Grand Rapids [4]	707	70	244	989.5	1,014.4	+.5	83	64	73.3	+5.5	92	30	40	8	23	59	69	2.21	−1.3	1.49	8	5	.0	0	9.5	s.	42	sw.	23	8	11	11	5.9	63
Lansing [4]	878	5	90	983.4	1,014.8	+.9	83	61	71.7	+4.9	91	30	37	8	31	60	70	4.89	+1.4	1.50	8	5	.0	0	10.9	s.	36	w.	14	9	11	10	5.4	73
Marquette	734	44	73	986.1	------	------	74	55	64.6	+5.7	93	11	37	7	106	----	--	5.02	+1.8	1.49	10	6	.0	0	7.9	------	31	nw.	30	6	13	11	6.1	64
Sault Sainte Marie [2]	614	10	52	987.5	1,014.1	+.2	74	50	61.5	+4.0	90	12	31	8	147	53	77	6.66	+4.0	2.63	10	4	.0	0	7.9	nw.	26	nw.	4	11	8	11	5.7	63
Chicago [2]	673	5	38	992.2	1,014.0	−.2	84	64	74.0	+5.9	95	30	50	8	16	60	66	3.65	+.2	2.73	7	3	.0	0	7.8	ssw.	26	s.	23	8	8	14	6.3	70
Green Bay	617	5	32	991.2	------	------	81	58	69.8	+4.9	92	30	38	8	37	----	--	3.58	−.1	1.34	9	8	.0	0	7.2	------	29	w.	24	6	13	11	6.0	75
Milwaukee [2]	681	33	66	988.8	1,014.0	+.1	80	59	69.5	+7.4	90	20	46	7	41	58	70	3.79	+.4	2.18	7	6	.0	0	10.5	nne.	38	s.	2	10	9	11	5.5	75
Duluth [4]	1,133	5	47	961.7	1,012.5	−.7	73	52	62.4	+5.2	90	11	41	7	128	52	72	2.94	−1.0	.72	8	8	.0	0	9.5	ese.	59	nw.	12	11	7	12	5.1	61
NORTH DAKOTA									64.4	+1.5							64	1.94	−1.6															5.6	
Fargo [2]	940	5	47	977.0	1,010.9	−1.3	78	54	65.6	+1.2	94	11	36	7	78	53	66	2.71	−1.3	.91	9	8	T	0	12.5	s.	44	s.	24	6	14	10	5.5	67
Bismarck [2]	1,677	5	41	952.3	1,011.0	−1.2	80	51	65.2	+2.3	99	29	39	18	77	51	63	1.24	−2.1	.44	11	11	.0	0	11.1	sse.	43	ne.	23	12	8	10	5.2	75
Devils Lake	1,478	11	44	958.3	------	------	75	52	63.4	+1.5	95	29	40	7	122	----	--	2.26	−1.3	1.07	11	8	T	0	8.5	------	35	sw.	29	9	12	9	5.1	72
Williston	1,878	42	50	944.1	------	------	76	52	63.6	+.9	94	10	40	4	107	----	--	1.53	−1.9	.92	8	8	.0	0	8.0	------	38	w.	29	5	7	18	6.8	79
UPPER MISSISSIPPI									74.0	+3.9							69	4.53	+.4															6.2	
Minneapolis-St. Paul [2]	919	43	74	979.3	1,011.7	−.5	83	61	72.2	+4.7	99	30	46	5	17	57	62	2.74	−1.5	.88	9	7	T	0	10.3	se.	38	nw.	25	9	10	11	5.6	69
La Crosse [2]	672	5	29	988.5	1,012.7	+.2	82	60	71.0	+4.0	93	30	47	7	15	59	68	3.96	−.1	1.33	9	7	.0	0	8.6	s.	33	w.	12	8	12	10	5.5	77
Madison [2]	974	27	39	982.7	1,013.9	+.4	84	58	70.9	+3.7	93	18	37	8	27	59	67	6.43	+2.7	2.23	10	8	.0	0	9.5	s.	34	sw.	1	11	9	10	5.6	74
Charles City	1,015	10	51	978.0	1,014.6	+1.4	82	62	72.0	+5.5	94	30	48	7	13	----	--	5.11	+.5	1.43	9	7	T	0	6.1	------	23	sw.	1	16	10	4	3.9	69
Moline [2]	606	6	50	991.5	1,014.1	+.6	84	63	73.6	+4.3	96	30	44	8	6	62	68	5.45	+1.3	1.97	9	7	.0	0	7.5	s.	40	ne.	23	5	13	12	6.4	70
Des Moines [4]	860	5	99	978.7	1,013.0	+.1	85	64	74.8	+4.2	95	23	53	8	3	63	72	5.74	+1.0	2.32	9	10	.0	0	8.2	------	47	se.	2	5	8	17	6.8	59
Dubuque	699	60	79	988.2	1,013.2	−.3	83	64	73.3	+3.9	94	30	46	8	9	60	68	4.85	+.5	1.71	11	8	.0	0	5.0	------	21	nw.	23	6	11	13	6.2	72
Burlington [2]	702	4	36	988.5	1,013.8	−.1	86	64	75.0	+3.5	97	30	49	8	1	64	73	5.84	+1.1	1.93	10	12	.0	0	9.5	------	42	nw.	21	6	11	13	6.3	75
Cairo	357	5	99	1,001.4	------	------	87	69	78.0	+.7	94	26	60	16	0	----	--	5.55	+1.7	1.11	13	12	.0	0	7.0	------	30	w.	26	5	6	19	7.1	69
Peoria [2]	609	7	26	991.9	1,014.0	−.2	85	64	74.7	+4.3	95	30	48	8	3	62	68	3.25	−.5	1.19	10	8	.0	0	9.2	s.	30	nw.	28	6	7	17	6.9	64
Springfield, Ill. [2]	636	5	49	991.9	1,013.9	+.4	85	64	74.8	+5.2	95	30	49	8	1	64	72	3.10	−1.0	1.44	9	6	.0	0	9.6	s.	30	e.	2	4	7	19	7.2	77
St. Louis [4]	568	33	59	993.6	1,013.6	−.6	86	69	77.8	+2.8	96	30	57	8	0	65	71	2.35	−1.5	.66	11	7	.0	0	9.9	------	34	se.	2	5	15	10	6.3	57

CLIMATOLOGICAL DATA FOR WEATHER BUREAU STATIONS FOR JUNE 1949—Continued

District and station	Elevation of instruments: Barometer above sea level [1]	Elevation of instruments: Thermometer above ground	Elevation of instruments: Anemometer above ground	Pressure: Station	Pressure: Sea level	Pressure: Departure from normal	Temperature of the air: Averages: Mean maximum	Temperature of the air: Averages: Mean minimum	Temperature of the air: Averages: Mean	Temperature of the air: Averages: Departure from normal	Temperature of the air: Extremes: Highest	Temperature of the air: Extremes: Date	Temperature of the air: Extremes: Lowest	Temperature of the air: Extremes: Date	Total heating degree days	Mean temperature of the dew point	Mean relative humidity [6]	Precipitation: Total	Precipitation: Departure from normal	Precipitation: Greatest in 24 hours	Precipitation: Days with 0.01 inch or more	Precipitation: Days with thunderstorms	Precipitation: Total snowfall (unmelted)	Precipitation: Snow, sleet, and ice on ground at end of month	Wind: Average hourly speed	Wind: Prevailing direction	Wind: Speed of fastest mile: Miles per hour	Wind: Speed of fastest mile: Direction	Wind: Speed of fastest mile: Date	Character of day (sunrise to sunset), number of days: Clear	Character of day (sunrise to sunset), number of days: Partly cloudy	Character of day (sunrise to sunset), number of days: Cloudy	Sky covers [7] tenths (sunrise to sunset)	Possible sunshine
MISSOURI VALLEY	Ft.	Ft.	Ft.	Mb.	Mb.	Mb.	°F.	°F.	°F.	°F.	°F.		°F.			°F.	%	In.	In.	In.			In.	In.	m. p.h.					0-3	4-7	8-10	0-10	%
Columbia, Mo. [4]	784	6	66	985.1	1,013.1	−.1	85	67	76.1	+2.7	94	30	59	8	0	66	77	5.93	+1.2	1.46	15	12	.0	0	5.8		28	sw.	23	7	8	15	5.8	62
Kansas City [2]	963	38	76	985.4	1,012.1	−.4	86	68	77.0	+3.4	97	20	60	15	0	66	71	6.41	+1.7	1.16	16	15	.0	0	7.4		54	nw.	21	6	7	17	6.8	54
St. Joseph [2]	967	5	51	977.7	1,012.1	−.4	86	66	75.8	+2.1	96	20	57	15	0	67	80	7.99	+3.3	1.99	15	15	T	0	9.8		44	w.	2	8	3	19	6.4	72
Springfield, Mo. [3]	1,324	5	50	967.2	1,014.0	−.2	85	65	75.0	+3.3	93	30	58	16	0	67	80	7.99	+3.3	1.99	15	15	T	0	9.8		44	w.	2	8	3	19	6.4	72
Topeka [4]	987	65	87	980.4	1,012.0	−.5	87	67	77.0	+3.6	98	23	60	15	0	67	78	7.10	+2.4	1.96	13	18	.0	0	8.0		34	ne.	25	6	9	15	6.5	61
Lincoln [4]	1,189	6	81	969.5	1,011.7	−.8	84	64	74.0	+2.6	97	30	53	7	4	64	77	7.43	+3.1	2.78	14	14	T	0	8.1		49	nw.	23	10	5	15	6.0	61
Norfolk, Nebr. [3]	1,551	5	38	957.0	1,012.0	------	82	62	71.6	+1.8	96	25	53	3	13	61	72	6.32	+1.6	3.39	11	8	T	0	----		----	----	----	12	8	10	5.2	--
Omaha [2]	1,105	5	68	977.3	1,012.0	−.5	84	64	73.8	+3.1	95	30	55	7	2	64	73	6.73	+2.2	2.45	11	10	T	0	9.4		41	nw.	23	7	8	15	6.1	63
Valentine	2,598	46	54	921.4	1,011.9	−.6	80	56	68.3	+1.4	98	26	47	7	41	54	62	2.22	−.6	.59	13	9	.0	0	8.2		33	nw.	23	7	17	6	5.3	74
Sioux City [2]	1,138	5	40	971.2	1,011.6	−.6	84	61	72.8	+4.0	97	30	51	3	3	61	71	3.08	−.9	1.96	11	7	.0	0	9.3		37	nw.	1	9	11	10	5.4	68
Huron [2]	1,301	5	41	964.8	1,011.1	−1.4	83	56	69.6	+3.4	93	26	44	7	24	57	66	2.35	−1.4	.91	12	9	T	T	11.6		65	se.	29	7	18	5	5.2	61
NORTHERN SLOPE																																			
									61.9	.0						57		1.86	−.4														5.7	
Billings [2]	3,570	16	39	880.3	1,011.2	−1.7	76	51	63.4	−1.5	92	10	42	17	106	44	55	2.12	------	.63	10	7	T	0	10.4	sw.	45	nw.	22	8	14	8	5.3	66
Butte	5,533	44	58	829.7	1,015.1	------	68	39	53.2	−2.5	86	10	29	30	356	37	57	2.41	+.1	.63	11	6	4.5	0	10.1	nw.	----	----	----	5	15	10	6.1	--
Glasgow	2,086	34	53	937.0	1,010.6	------	79	51	65.2	+1.2	97	10	33	18	73	43	49	1.18	−1.8	.25	12	6	.0	0	----	----	----	----	----	4	14	12	6.4	--
Great Falls [2]	3,657	16	75	886.6	1,011.9	------	72	50	61.2	−1.2	91	10	36	18	151	41	51	1.54	−1.6	.89	10	3	T	0	14.0	sw.	56	w.	29	7	11	12	6.2	75
Havre	2,507	11	67	923.5	1,011.2	−1.0	77	51	63.9	+1.9	95	10	37	18	82	----	----	.73	−2.1	.41	7	5	T	0	9.2	sw.	36	ne.	11	4	16	10	6.2	72
Helena [2]	4,124	5	43	872.7	1,012.9	.0	72	47	59.6	+.4	90	10	33	18	183	40	53	1.56	−.5	.83	11	9	T	0	9.4	w.	42	w.	29	7	14	9	5.7	79
Missoula [2]	3,263	4	32	900.8	1,013.7	−.6	73	45	59.4	−.2	91	10	31	30	189	39	52	1.06	−.9	.56	10	3	.0	0	6.9	nw.	38	nw.	26	8	12	10	6.0	54
Kalispell [2]	2,973	48	56	909.9	1,012.0	−.9	72	46	59.2	+1.5	86	11	33	18	188	41	--	.58	−1.5	.21	5	4	.0	0	10.9	sse.	----	----	----	3	18	9	6.4	--
Miles City [2]	2,371	5	28	928.5	1,011.4	−1.1	79	52	65.8	------	96	10	42	4	71	44	--	.92	------	.43	10	9	.0	0	10.4	wnw.	----	----	----	9	14	7	5.3	--
Rapid City [2]	3,259	5	56	901.1	1,011.6	−1.3	78	51	64.4	+.2	96	29	42	14	92	49	62	3.24	+.2	1.99	9	10	.0	0	13.0	----	49	sw.	26	12	7	11	5.0	69
Cheyenne [2]	6,094	22	40	811.4	1,011.5	.0	71	48	59.7	−.7	86	29	42	1	176	45	64	3.26	+1.6	1.09	16	10	T	0	9.6	----	37	w.	1	6	11	13	6.3	58
Lander [2]	5,352	6	30	834.7	------	------	73	48	60.2	−.3	85	25	37	2	168	40	52	1.32	+.2	.44	11	12	.0	0	8.0	----	56	s.	28	13	7	10	4.8	68
Sheridan [2]	3,790	5	38	882.5	1,012.0	−.5	76	47	61.8	+.3	91	28	39	4	126	46	60	2.30	+.3	1.32	11	8	.0	0	7.7	----	45	s.	28	15	6	9	4.6	60
North Platte [2]	2,821	11	51	915.0	1,011.1	−1.1	80	58	69.0	+1.5	94	26	48	1	31	58	73	3.84	+.6	1.24	16	11	T	0	9.6	----	47	w.	1	10	9	11	5.8	61
MIDDLE SLOPE																																			
									73.8	+1.3						68		3.92	+.7														5.8	
Denver [4]	5,292	106	113	836.4	1,011.1	−.4	77	55	66.2	−.1	94	29	46	4	72	46	57	3.95	+2.6	1.54	14	8	T	0	7.3	----	29	nw.	1	9	7	14	5.9	58
Pueblo [2]	4,690	5	36	855.7	1,011.0	+.5	82	55	68.2	−.4	97	29	44	2	40	49	56	3.12	+1.8	1.25	12	8	.0	0	7.2	----	42	nw.	1	10	7	13	5.9	62
Concordia	1,392	50	58	962.4	1,010.8	−1.4	85	65	75.0	+2.0	97	30	55	3	0	63	71	5.76	+1.4	4.12	13	16	T	0	8.0	----	50	nw.	28	11	5	14	5.6	59
Dodge City [2]	2,509	5	58	924.8	1,010.6	−1.3	85	63	73.8	+1.3	99	20	51	2	6	62	71	3.30	0	1.03	8	12	T	0	11.4	----	63	s.	23	11	9	10	5.4	72
Wichita [2]	1,358	52	64	963.8	1,011.2	−.7	86	67	76.5	+2.1	95	30	60	3	0	65	71	3.16	−1.2	.81	11	9	.0	0	13.9	----	42	nw.	3	10	6	14	5.8	61
Oklahoma City [4]	1,214	10	47	965.8	1,011.6	−.6	88	70	78.7	+2.7	97	21	63	3	0	67	73	4.35	+.7	1.30	13	6	.0	0	8.6	s.	24	s.	3	12	8	10	5.3	62
Tulsa [2]	674	10	60	988.5	1,012.0	------	88	69	78.3	+1.8	95	22	61	16	0	69	77	3.78	−.7	1.04	10	10	T	0	8.6	s.	42	sw.	7	9	4	17	6.6	59
SOUTHERN SLOPE																																			
									78.7	+.6						61		2.39	−.3														4.7	
Abilene [2]	1,755	4	59	951.2	1,009.2	−2.0	91	68	79.8	+2.2	95	21	60	8	0	64	62	3.07	+.1	1.26	9	9	.0	0	13.7	s.	42	nw.	8	13	12	5	4.3	80
Amarillo [2]	3,604	5	42	887.6	1,010.0	−1.5	86	61	73.6	+2.2	98	26	51	3	0	59	64	2.82	.0	.84	12	15	T	0	12.4	sw.	42	se.	28	12	10	8	5.3	76
Del Rio	960	63	71	977.0	1,010.0	−.5	92	73	82.6	−.8	104	24	62	8	0	68	66	1.80	−.8	.69	4	9	.0	0	10.5	se.	34	nw.	8	7	17	6	5.2	72
Roswell	3,614	6	29	888.9	1,008.8	−1.0	92	62	76.6	+.3	102	17	50	8	0	55	50	2.84	+1.2	.97	9	16	T	0	8.9	s.	39	s.	3	14	10	6	4.2	70
Wichita Falls	1,030	4	49	975.3	1,010.9	------	91	70	80.8	−.9	98	21	63	3	0	66	63	1.41	−2.1	.62	9	8	.0	0	13.4	s.	58	w.	3	12	12	6	4.6	--
SOUTHERN PLATEAU																																			
									94.4	+1.2						34		.53	+.3														3.2	
El Paso [2]	3,916	35	85	883.2	1,007.1	−.7	94	67	80.6	+2.6	102	17	60	3	0	46	32	.51	−.1	.24	6	8	T	0	10.1	s.	42	se.	29	17	10	3	3.6	87
Albuquerque [2]	5,314	5	45	836.4	1,006.5	−1.3	88	59	73.7	+1.1	98	16	49	8	3	43	40	.32	−.2	.15	8	14	.0	0	9.8	nnw.	47	se.	3	13	12	5	4.1	78
Flagstaff	6,907	34	48	791.7	1,013.9	+5.4	76	43	59.5	.0	88	15	32	1	167	39	50	2.19	+1.7	.95	9	14	T	0	6.0	----	----	----	----	12	9	9	4.7	--
Phoenix [4]	1,107	39	87	969.2	1,007.1	+.3	101	72	86.4	+1.9	109	16	59	4	0	49	30	.14	+.1	.14	1	1	.0	0	7.0	----	29	w.	3	19	9	2	2.7	90
Tucson [2]	2,555	5	39	921.8	1,007.7	+.2	98	68	83.0	+.4	107	16	54	4	0	39	23	.02	−.2	.02	1	2	.0	0	8.8	----	33	sw.	3	16	9	5	3.3	89
Yuma	142	9	54	1,002.0	1,006.8	.0	104	74	88.8	------	112	16	64	4	0	48	27	.00	------	.00	0	0	.0	0	8.0	----	29	nw.	3	27	3	0	.9	97
MIDDLE PLATEAU																																			
									64.3	+1.0						42		.36	−.2														3.3	
Ely [2]	6,262	8	41	808.7	------	------	75	40	57.6	+1.8	86	15	27	1	224	----	----	.57	.0	.28	6	4	T	0	12.1	----	40	ne.	3	15	10	5	3.7	80
Reno [2]	4,527	20	52	864.9	1,012.5	+.6	83	42	62.8	+1.7	94	15	32	1	114	37	41	.13	−.2	.13	2	0	.0	0	6.4	----	36	sw.	16	23	5	2	1.9	92
Winnemucca	4,339	5	56	866.6	------	------	82	48	65.2	+2.4	97	10	35	2	73	----	--	.39	−.3	.30	2	1	T	0	8.1	----	34	w.	28	22	6	2	2.4	82
Salt Lake City [2]	4,357	32	58	868.9	1,010.4	−.1	81	53	67.0	+1.3	93	16	41	3	54	42	43	.17	−.6	.05	6	5	T	0	10.1	----	49	ne.	3	15	10	5	3.9	84
Grand Junction [2]	4,602	5	26	858.1	1,011.0	+.8	83	55	69.0	−2.4	96	16	41	2	41	41	41	.53	+.1	.16	7	11	T	0	8.6	----	47	sw.	23	15	7	8	4.5	71
NORTHERN PLATEAU																																			
									62.7	+.4						44		.30	−.7														4.3	
Baker [4]	3,471	36	54	895.4	1,015.1	+.2	74	43	58.8	+.2	90	9	33	30	205	39	--	.14	−1.2	.09	6	1	T	0	6.2	n.	17	nw.	12	13	14	3	4.0	79
Meacham	4,056	7	28	877.4	1,016.8	------	68	41	55.0	------	84	6	31	17	306	37	54	.78	------	.41	7	0	T	0	6.9	wnw.	----	----	----	9	16	5	4.9	--
Boise [2]	2,739	5	49	917.7	1,012.4	−.5	80	51	65.6	+1.1	97	10	37	17	72	40	42	.37	−.6	.22	3	4	.0	0	10.3	nw.	35	nw.	16	19	9	2	2.8	90
Lewiston	1,436	4	23	962.8	1,013.9	------	81	52	66.2	------	95	6	40	30	60	41	42	.35	------	.20	4	1	T	0	7.4	w.	----	----	----	9	13	8	5.1	--
Pocatello [2]	4,478	5	31	860.5	1,011.1	−.4	78	48	63.0	+1.5	89	10	35	3	106	39	44	.56	−.5	.24	6	2	T	0	10.1	s.	40	sw.	16	15	14	1	3.1	83
Ellensburg [2]	1,735	5	58	953.6	1,013.8	------	76	47	61.4	−.4	92	5	34	30	137	39	47	.05	−.6	.05	1	0	.0	0	18.5	nw.	----	----	----	11	15	4	4.6	--
Spokane [2]	1,929	6	51	945.5	1,013.7	+.2	75	48	61.8	−1.0	92	6	37	30	132	37	41	.22	−1.1	.15	3	1	T	0	9.2	ssw.	42	sw.	24	6	18	6	5.4	78
Walla Walla	991	57	65	979.0	1,014.7	+.8	80	55	67.6	+1.1	97	6	44	17	51	43	--	.24	−.9	.14	6	0	.0	0	5.9	s.	27	sw.	24	14	14	2	3.9	78
Yakima [2]	1,076	4	54	976.0	1,014.4	+.5	83	48	65.2	+.2	100	6	34	30	78	39	40	.02	−.3	.01	2	0	.0	0	9.0	w.	----	----	----	11	15	4	4.5	--

See footnotes at end of table.

CLIMATOLOGICAL DATA FOR WEATHER BUREAU STATIONS FOR JUNE 1949—Continued

District and station	Elevation of instruments: Barometer above sea level [1]	Elevation of instruments: Thermometer above ground	Elevation of instruments: Anemometer above ground	Pressure: Station	Pressure: Sea level	Pressure: Departure from normal	Temperature of the air: Averages: Mean maximum	Mean minimum	Mean	Departure from normal	Temperature of the air: Extremes: Highest	Date	Lowest	Date	Total heating degree days	Mean temperature of the dew-point	Mean relative humidity [6]	Precipitation: Total	Departure from normal	Greatest in 24 hours	Days with 0.01 inch or more	Days with thunderstorms	Total snowfall (unmelted)	Snow, sleet, and ice on ground at end of month	Wind: Average hourly speed	Prevailing direction	Speed of fastest mile: Miles per hour	Direction	Date	Character of day (sunrise to sunset), number of days: Clear	Partly cloudy	Cloudy	Sky cover [7] tenths (sunrise to sunset)	Possible sunshine
NORTH PACIFIC COAST	Ft.	Ft.	Ft.	Mbs.	Mbs.	Mbs.	°F.	°F.	°F.	°F.	°F.		°F.			°F.	%	In.	In.	In.			In.	In.	m.p.h.					0–3	4–7	8–10	0–10	%
									59.9	+.2							63	.56	−1.0														5.1	
Kelso [2]	750	38	76				72	44	58.0																									
North Head	211	5	55	1,011.9	1,019.3	+1.3	58	50	53.6	−1.2	62	22	46	8	343			.48		.14	10	1	.0	0	6.6	wnw.				7	11	12	6.0	
Seattle [4]	125	90	321	1,013.9	1,018.4	+1.5	70	51	60.8	−.6	85	5	47	30	138	47	65	1.35	−.9	.36	12	0	.0	0	15.7	n.	40	n.	10	3	9	18	7.5	44
Tacoma	194	172	201	1,011.5	1,018.3	+1.0	69	50	59.3	+.6	79	5	45	30	174			.23	−1.1	.08	7	1	.0	0	8.5	n.	30	sw.	19	9	9	12	5.7	57
Tatoosh Island	86	5	61	1,016.3	1,019.3	+1.7	55	48	51.6	−1.4	62	18	44	18	401	48	88	.71	−.8	.34	7	1	.0	0	8.8	n.	36	sw.	15	11	11	8	4.9	68
Burns	4,162	35	47	873.0	1,014.2		76	43	60.0	+1.5	92	10	31	2	170	33	38	2.05	−1.2	.97	11	0	.0	0	10.6	s.	38	s.	16	3	6	21	7.9	48
Eugene [2]	433	4	35	1,004.4	1,018.2		77	46	61.7		89	5	37	2	116	48	63	T	−1.0	T	0	1	.0	0						21	5	4	2.9	
Medford [2]	1,329	29	58	968.8	1,016.1	+1.2	84	49	66.2	+.4	97	5	39	2	52	43	49	.32		.15	5	0	.0	0	8.6	n.				11	12	7	4.4	
Portland, Oreg. [4]	154	68	106	1,012.9	1,018.4	+1.8	74	53	63.6	+1.2	89	5	48	30	82	48	64	T	−.8	T	0	0	.0	0	8.1	nw.				19	8	3	2.6	
Roseburg	510	45	76	999.3	1,017.6	+1.0	78	49	63.8	+1.3	92	5	39	2	79			.44	−1.1	.22	7	0	.0	0	6.7	nw.	23	w.	28	8	9	13	5.7	62
																		.03	−1.1	.03	1	0	.0	0	5.9	n.	21	n.	17	15	12	3	3.8	80
MIDDLE PACIFIC COAST																																		
									66.2	+2.0							51	.02	−.4														2.9	
Eureka	60	72	88	1,015.2			59	49	54.0	−.3	70	4	43	17	329			.06	−.7	.05	2	0	.0	0	7.5		39	nw.	16	10	12	8	5.0	69
Red Bluff [2]	353	5	26	998.3	1,010.7		94	65	79.4	+4.6	108	14	54	1	0	41	28	.00	−.5	.00	0	0	.0	0	9.4		32	nw.	25	25	3	2	1.8	94
Sacramento [4]	66	92	115	1,008.5	1,011.2	−.3	89	57	72.8	+3.4	103	13	50	29	5	49	50	T	−.2	T	0	0	.0	0	8.0		26	nw.	2	27	2	1	.9	96
San Francisco [4]	155	112	132	1,012.9	1,013.4	−.5	64	53	58.8	+.3	92	4	50	29	214	50	75	T	−.2	T	0	0	.0	0	11.2		31	sw.	28	16	8	6	3.8	71
SOUTH PACIFIC COAST																																		
									71.8	+2.8							60	T	−.1														3.1	
Fresno [2]	327	5	34	999.0	1,010.6	−.2	96	61	78.5	+2.8	107	13	54	2	0	47	37	T	−.1	T	0	0	.0	0	8.1		20	nw.	1	27	2	1	.9	95
Los Angeles	338	236	263	1,008.5	1,012.7	−.2	80	60	69.7	+3.3	97	22	54	1	0	56	72	T	−.1	T	0	0	.0	0	6.2		32	n.	3	14	13	3	3.7	71
San Diego [2]	87	20	55	1,009.8	1,012.8	−.1	73	61	67.2	+2.2	85	21	56	1	1	57	72	T	.0	T	0	0	.0	0	7.0		17	w.	17	10	15	5	4.7	60
WEST INDIES																																		
San Juan, P. R.	82	9	54	1,014.2	1,017.3		83	74	78.9	−.8	91	6	71	27	0			6.21	+.9	2.32	18	5	0	0	12.2	e.	32	e.	18	2	16	12	6.6	71
ALASKA																																		
Anchorage [2]	132	6	44	1,006.8	1,011.9		59	42	50.6	−3.3	66	27	36	15	433	40	67	2.94	+2.2	.74	16	2	.0	2		s.	29	s.	3	2	6	22	8.4	
Annette Island	113	5	53	1,013.2	1,017.3		56	46	51.0	−3.6	71	16	43	11	422	44	82	9.74	+4.8	2.36	19	0	.0	0	10.8	wnw.				2	3	25	8.7	
Barrow	29	5	27	1,011.5	1,011.9		34	28	30.5	−3.7	42	17	21	1	1,034	28	91	.26	.0	.06	7	0	T	0	10.6	ese.	22	s.	11	0	3	27	9.0	
Bethel [2]	28	5	31	1,011.9	1,013.2		54	41	47.2	−5.5	66	10	35	4	529	40	78	.67	−.5	.24	12	0	.0	0	11.8	nw.				1	7	22	8.5	
Cordova [2]	45	5	32	1,010.2	1,012.2		55	40	47.4	−2.7	66	9	32	7	529	42	82	6.95	+2.8	1.44	25	0	.0	0	4.9	ese.	23	ese.	20	1	7	22	8.2	
Fairbanks [2]	455	5	63	992.9	1,009.8		61	42	51.6	−7.2	77	1	35	3	401	44	77	3.55	+2.2	1.03	26	6	.0	6		wsw.	32	se.	1	0	3	27	8.6	
Galena	139	4	66	1,005.1	1,009.8		58	44	51.0	−6.7	70	1	36	19	421	38	64	1.31	+.1	.43	14	2	.0	2		sw.				3	13	14	7.2	
Gambell	32	5	32	1,013.2	1,014.2		38	32	34.9	−3.1	45	30	26	1	899	32	92	.60	+.1	.18	9	0	2.0	0	10.7	wsw.	30	ne.	11	1	6	23	8.4	
Juneau [2]	80	6	30	1,014.2	1,015.2		56	42	49.3	−3.7	68	9	33	8	470	42	80	5.34	+1.7	1.00	25	0	.0	0		ese.	29	se.	5	1	4	25	9.1	
Kotzebue [2]	20	5	31	1,010.8	1,011.5		40	32	36.2	−7.1	49	16	25	1	865	33	91	.78	+.3	.18	11	0	.0	0		w.				3	7	20	7.8	
McGrath [2]	341	5	31	998.6	1,011.5		58	42	50.4	−5.6	74	1	35	30	436	40	70	2.10	+.2	.51	21	5	.0	5	6.3	wnw.				0	4	26	9.0	
Nome [2]	22	10	75	1,012.5	1,013.2		45	34	39.5	−6.1	59	11	25	22	765	35	88	.95	−.2	.21	11	0	.0	0		wsw.	37	sw.	8	2	8	20	8.1	
Northway [2]	1,718	5	32	947.5	1,010.5		58	40	49.4	−6.1	68	10	32	26	472	39	66	1.92	−.1	.81	21	0	.0	0	7.2	nw.				0	2	28	9.0	
HAWAII																																		
Honolulu [4]	38	86	98	1,016.3	1,016.6		81	71	76.0	−.6	83	26	69	21	0			.73	−.2	.42	10	0	.0	0	8.2		22	e.	6	6	14	10	5.6	62

[1] Height of barometer cistern above mean sea level on Jan. 1, 1900, or when station was first established since Jan. 1, 1900. When station is moved to new location or airport, the pressure is reduced to the original elevation for homogeneity. These elevations do not represent the present station elevation in most cases.

[2] Data are from airport records. Pressures adjusted to original elevations according to note 1.

[3] Barometric, hygrometric, wind, character of day, and average cloudiness data from airport records; remainder from city office records.

[4] Barometric and hygrometric data from airport records, remainder from city office records.

[5] Barometric, temperature, degree day, and hygrometric data from airport; remainder from city office records.

[6] As of Jan. 1, 1949, relative humidity values at temperatures below 32° F. are expressed with respect to water rather than with respect to ice, as used prior to that date. Therefore, these hygrometric values before and after Jan. 1, 1949, cannot accurately be combined without necessary conversion.

[7] As of Jan. 1, 1949, "Sky cover" has been substituted for "Average cloudiness" to include smoke, snow, etc., in addition to clouds that obscure the sky.

NOTE.—Unless otherwise indicated, data in table are city office records.

SEVERE STORMS FOR JUNE 1949

[The table hereunder contains such data as have been received concerning severe storms that occurred during the month.]

Place	Date	Time	Width of path, yards	Loss of life	Value of property destroyed	Character of storm	Remarks
Northern Cass and southern Jackson Counties, Mo.	June 1	12:02–12:15 a. m.	440	0	$100,000	Tornado	Path from 8 miles southwest of Pleasant Hill to 9 miles northeast of town. Much damage to barns, corn cribs, hog houses, poultry and other farm buildings; some blown down. Telephone and light wires broken and scattered. Many trees damaged or destroyed. Crop damage estimated at $12,500, included in total.
Southern Howard, southeastern Saline Counties, and scattered areas of Randolph, Linn, Platte, Cole, and Boone Counties, Mo.	1	12:30–3 a. m.		1	5,000	Tornadoes, wind, and electrical.	Tornadoes struck Franklin and Nelson communities, resulting in heavy damage at each place. Boonville, New Franklin, Fayette, Columbia, and Moberly had some damage, mostly to trees, by strong winds. Man killed when he contacted a power line which had blown down. Telephone operator slightly injured when lightning struck building housing exchange at Weston. 9 cows killed by lightning near Columbia. Home at Jefferson City set afire by lightning. Slight crop damage by moderate hail.
Nance County, Nebr.	1	Noon	[1] 2		100,000	Hail	Path 20 miles long.
Kearney to north of Gibbon, Nebr.	1	12–12:30 p. m.	[1] 5		82,000	do	Crop damage $57,000; other property $25,000. Path 15 miles long.
Kosciusko, Miss.	1	3 p. m.				Thundersquall	Trees uprooted, power and communication lines severed.
Rawlins County, Kans.	1	4 p. m.	[1] 3		150,000	Hail	Storm caused damage over path 15 miles long in south-central part of county. Mostly crops damaged.
Nebraska City (3¼ miles west), Nebr.	1	5:40 p. m.	100	0	20,000	Tornado	Damage mostly to farm buildings.
Page County, Iowa	1	6:15–6:30 p. m.	100–200	0	350,000	Tornadoes, with hail.	This most destructive twister had its beginning 3 miles east and a mile south of Shenandoah. It passed across southeastern Bingham. Intensity of storm increased and path began to widen 2 miles northeast of Bingham. Crib with over 10,000 bushels of corn scattered so far that little was recovered. Storm path 10 miles long. About 2 to 2½ miles east of where first tornado reached its peak, a second tornado was in evidence, with path northeastward and parallel to No. 1. Tornado No. 2 less destructive and path only about 5 miles long. 4 farms almost totally destroyed and 8 farms hit with varying degrees of damage. Although eye witnesses reported a 3d funnel farther east, no evidence was apparent from the air. 4 persons injured; one received scalp wounds from large hailstones, which averaged 1 inch in diameter with largest sizes near 2½ inches. Livestock loss rather large. Livestock and crop damage estimated at near $50,000. A disc blade was found buried 3 inches deep in a tree.
Nemaha County, Kans.	1	7:15 p. m.	450	0	75,000	Tornadoes	Path of destruction began about 3 miles east of Baileyville and extended northeastward approximately 15 miles, ending 1 mile east of Bern. Numerous farm homes, barns, and auxiliary buildings destroyed. Many trees, power and communication lines damaged. Well-developed, long, slender funnel-shaped cloud observed. A second funnel cloud reported over Seneca about 20 minutes after first one, but it did not reach ground.
New Orleans, La.	1	9 p. m.				Electrical and wind.	Radio tower station WEEZ destroyed by lightning and high winds.
Southwest, northwest, and central Iowa.	1	Evening and night.				Wind	High winds knocked down power lines near Prescott, severing power between Des Moines and southwestern Iowa. Many points reported local damage from broken tree limbs or overturned small buildings. At Shenandoah 2 inches of rain fell in an hour. Crop damage minor, except in southwest near tornado area.
Winside (5 miles south), Nebr.	1		[1] 3		15,000	Hail and wind	Hailstones small, but numerous and accompanied by high wind.
Oshkosh (northwest of), Nebr.	1		[1] 3		52,275	Hail	Path 10 miles long. Grass and crop damage estimated at $52,000 included in total. Backs of range cattle bruised.
Falls City (west of), Nebr.	1–2	8 p. m. to after midnight.	[1] 2	0	790,000	Tornado and rain	About half of damage to crops and remainder to buildings and livestock. Severe flood loss in lowlands, and soil erosion and washing out of corn in rolling uplands.
Eastern Atchison and Carroll Counties, Mo.	1–2	P. m.–7 a. m.		0		Tornado and wind	Tornado destroyed and damaged farm buildings about 5 miles southeast of Tarkio, injuring several persons. At Carrollton high winds damaged at least 1 house, broke a number of power lines and trees, and set rock decorations atop court house at precarious angle.
Jackson County, Kans.	2	Midnight to 1 a. m.	[1] 3			Hail	Hail, mostly small, but ranging up to 1 inch in diameter, damaged gardens and crops over several square miles southwest of Soldier.
Caddo County, Okla.	2	7–7:45 p. m.	67	0	3,000	Tornado	Storm circled an area of 1 mile in radius, 3 miles northeast of Alfalfa. 3 funnels observed; 1 touching ground, tearing up large grove of trees. 1 barn unroofed.
Post, Garza County, Tex.	2	9 p. m.	[1] 10		40,000	Wind and hail	40 square miles of crops will have to be replanted. Hail moderate; largest, size of golf balls. Wind damage, $24,000; hail, $16,000. All damage to cotton and wheat.
Jackson County, Okla.	2	Night				Rain and wind	Considerable damage to ripe wheat. 3.40 inches of rain fell at Altus.
Meeker (near), Colo.	3	4 a. m.	[1] 3		20,000	Hail	Hailstones from ¾ to ¾ inch in diameter covered ground to depth of 2 inches. Practically all crops within an area from near Meeker station to 8 miles north a total loss.
Pawnee County, Kans.	3	Early morning	[1] 1		10,000	do	Storm moved southeastward in northern portion of county over path 3 miles long. Hail mostly size of marbles. Crops main loss.
Marion County, Kans.	3	12:30 p. m.	[1] 2		150,000	do	Damage extended over path 10 miles long near Lost Springs, in northern part of county. Many hailstones as large as hens' eggs. Principal damage to crops.
Osage County, Kans.	3	1:30 p. m.	[1] 3		5,000	do	Storm path 4 miles long. Mostly crop damage.
Sumner County, Kans.	3	1:30 p. m.		0	6,000	Tornado and wind	Only damage resulting from tornado was to large barn 6 miles northwest of Wellington. High wind caused some damage over 3-mile path in same area.
Roger Mills and Ellis Counties, Okla.	3	3:30–7:20 p. m.			125,000	Tornadoes, wind, hail, and electrical.	In area 5 x 30 miles west of Leedey, from Strong City to east of Arnett. Loss of $100,000 to crops and $25,000 to roofs and glass by hail. 2 tornado funnels reported, but did not reach ground. 2 animals killed by lightning.
Houma, La.	3	3:45 p. m.				Thundersquall	Trees uprooted and limbs broken. Telephone and power lines down for several hours. Advertising signs blown down.
Washington County, Okla.	3	4–4:15 p. m.	880	0	0	Tornado	North and northeast of airport at Bartlesville; moved northeastward for about 2½ miles in open country, filling air with debris. No property in path.
Northeastern Monroe and southern Marion Counties, Mo.	3	5:20 p. m.		0	0	do	Tornado cloud estimated to be about 1,000 feet above ground, passed over Monroe City moving northeastward.
Leedey (near), Okla.	4	1:30 a. m.	440		2,500	Wind	High, straight, gusty wind from southeast. Debris in line of path.
Prowers County, Colo.	4–5				1,750,000	Rain, hail, and floods.	Flash flood, caused by nearly 7 inches of rain, swept over lower Arkansas River Valley, mainly in areas of Bristol, Lamar, and Holly. As much as 4 feet of debris piled up in many places. Highway traffic halted and 100 feet of Santa Fe Railway track washed out.

[1] Miles instead of yards.

SEVERE STORMS FOR JUNE 1949—Continued

Place	Date	Time	Width of path, yards	Loss of life	Value of property destroyed	Character of storm	Remarks
Florence-Portland area, Colo.	June 5	5 a. m.–6 p. m.	[1] 6		$250,000	Rain, hail, and floods.	Downpours causing a wall of water 10 feet above flood stage, inundated Florence-Portland area in southeastern Fremont County; heavy damage to buildings, railroads, and highways. 31 homes swept away or upset.
Muskogee, Okla.	5	10:30 a. m.	14	0	1,000	Tornadoes	3 tornado funnels observed, but only 2 touched ground. 1 funnel on ground for about 75 feet. The other about 10 blocks to the northeast struck, unroofing a shed and tearing off a porch.
Cloud County, Kans.	5	3–4 p. m.	[1] 2			Hail	Storm moved eastward over path 8 miles long across southern portion of county.
Molena, Ga.	5	Afternoon			3,000	Wind and hail	High winds and hail damaged houses, outbuildings, and turkey sheds; also, blew down or delimbed a few trees. About 1,000 turkeys killed.
Shell, Wyo.	5	do.		0		Tornado	Principal damage to trees, fences, and windows.
Nashville, Tenn.	5	5 p. m.				Thunderstorm, with rain and hail.	Electric wires downed in various sections of city. Heavy trees felled in Thompson Lane-Franklin road area. Damage to Cascade Swimming Pool, $300 to $400.
Buffalo, Wyo.	5	5–6 p. m.		0		Tornado and hail	Slight damage to growing crops by hail. Tornado funnel failed to reach ground.
Boise County, Idaho	5	7 p. m.				Rain	Runoff from heavy rain concentrated in small draw swept mud, boulders, and trees across Boise-Idaho City Road, blocking traffic for 4 hours. Slide occurred about 25 miles from Boise.
Colorado Springs, Colo.	6	12:02–4:36 p. m.	[1] 4		20,000	Wind, hail, and rain	Storm path 20 miles long, east of Colorado Springs. Hail, piling up to 6 inches, resulted in damage to crops, livestock, and buildings. Much damage also to streets and highways by runoff.
Roswell, N. Mex.	6	3:30 p. m.	300	0		Tornado and hail	Funnel struck open country southwest of city, passing within 3 miles of Walker Field. No buildings in path of storm. Path approximately 12 miles long. Heavy hail reported. Little damage.
Cimarron, N. Mex.	6	P. m.		0	0	Tornado	Small funnel reported over range land about 4 miles east of Cimarron.
Devine, Medina County, Tex.	6	Evening	[1] 2–5	0	500,000	Hail	Most serious crop damage northwest of Devine where corn and cotton leveled.
Dunlay, Medina County, Tex.	6	do.	[1] 2–5		100,000	Wind and hail	Heavy damage in southern part of community. Wind blew over crops not damaged by hail.
Biry, Medina County, Tex.	6		[1] 1½			Hail	32 acres of corn ruined.
Buffalo, Wyo.	6			0	0	Tornado	Funnel failed to reach ground.
Albany to extreme southern Dougherty County, Ga.	7	1:40–6 p. m.	[1] 5–6		5,500	Wind and hail	Hail, ¼ to ½ inch in diameter, caused crop loss estimated at $3,000, involving chiefly watermelons, cotton, vegetables, and peanuts. Property damages due more from lightning than wind, affecting 2 residences and 1 garage; 800 telephones and almost all long distance lines out of service; heavy damage to high voltage line. Storm moved for 10 miles southward.
Optimo and vicinity, N. Mex.	7	2 p. m.			2,000	Hail	Principal damage to beans and small grains.
Osage County, Kans.	7	2 p. m.	880	0	5,000	Tornado	Funnel-shaped cloud dipped to ground 4 or 5 miles north of Quenemo, damaging barns and other farm buildings. Path about 1 mile long.
Green County (central portion), Mo.	7	3:20 p. m.		0	25,000	Tornado, electrical, and hail.	Small tornado damaged trees, farms, and small business places in small area just west of Springfield. Some high voltage lines, fused by wind, cut off power in some areas. Lightning and hail did some damage in scattered places. Hailstones measured up to 4 inches in circumference, with some damage to gardens and crops.
Tulsa County, Okla.	7	4 p. m.	400		2,000	Wind	In Skiatook and vicinity several small buildings blown down; accompanied by light, small hail.
Montgomery, Ala.	7	4–4:45 p. m.			4,220	Thundersquall	Destroyed hangar at Norman Bridge Airport, and slightly damaged some small airplanes with flying debris. Damage confined to small area, with some timbers and roof sections blown 2 to 5 hundred feet.
Jefferson Parish, La.	7	Early afternoon.				Hail	Heavy hail of brief duration lashed small area east of the River and moved into Carrollton section of New Orleans.
Saline County, Kans.	7	Afternoon	[1] 1			do	Hailstones small, but very numerous and driven by high wind. A number of farms near New Cambria suffered almost 50 percent loss of crops.
Chaves County (southern part), N. Mex.	7	P. m.				do	Scattered crop damage. Cumulative loss to crops from hail for season estimated at $100,000 in county.
Montgomery County, Kans.	7–8	Noon to 8 a. m.			8,000	do	Path northeastward from county line south of Coffeyville to Edna, 20 miles northeast. Most damage to wheat.
Kingsville, Kleberg County, Tex.	8	1 a. m.	[1] 5		5,000	Wind and hail	Grain in head blown over. Cotton bolls blown off. Wind damage, $3,500; hail, $1,500.
Albany, Ga.	8	3:15–6 p. m.	[1] 3–5		1,000	Electrical	Lightning struck 2 homes, burning out wiring and burning holes in ceiling and roof of 1. Great number of telephones out of service; some knocked out by storm of previous day.
Bonneville, Madison, and Jefferson Counties, Idaho.	8	4:20–6:30 p. m.			75,000	Rain and wind	Storm 4 miles northwest of Idaho Falls and in Roberts-Menan area. Damage to crops estimated at $75,000, 30 percent by high wind and 70 percent by rain. At Idaho Falls Airport 0.69 inch of rain fell in 25 minutes.
Concord (near), Ga.	8	Afternoon			1,000	Wind and hail	Storm moved southeastward for about 3 miles, with heavy hail in spots but mostly away from crop fields. High winds caused all damage, which included 2 barns unroofed, 2 tenant houses moved from their foundations, minor damages to other buildings, and some trees blown down.
Belvidere, Nebr.	8	6:42 p. m.	100	3	75,000	Tornado	Path 1 mile long. 7 persons injured. A brick restaurant demolished and adjoining buildings damaged.
Shelton, Nebr.	8	7:30 p. m.			500	Wind	Damage to buildings.
Portales, N. Mex.	8	7:45 p. m.			30,000	Hail and rain	Wheat, cotton, and young row crops damaged over considerable area east of city.
Horse Cave, Ky.	9	3–3:45 p. m.		1		Electrical	1 person killed by lightning 2½ miles east of Horse Cave during a heavy electrical and rain storm.
Marshall, Wyo.	9	4 p. m.		0	0	Tornado	Funnel sighted, but failed to reach ground.
Sarasota, Fla.	10	1 p. m.		0	0	Waterspout	A mile or 2 offshore, about 10 miles southwest of station.
Fergus County (north portion), Mont.	10	4–4:30 p. m.	[1] ¾–1		1,200	Hail	Damage to small grain and gardens.
Absarokee, Mont.	11	3–3:30 p. m.	880		1,000	do	Damage to hay and grain.
St. Louis, Mo.	11	5–6 p. m.				Wind	Wires down and tree limbs broken in various parts of city.
Alfalfa County (southern half), Okla.	11	9:15–11:45 p. m.			450,000	Rain	Unofficial rainfall of more than 9 inches reported south of Cherokee. Heavy local flooding at Cherokee; about 200 homes had from ½ to 3 feet of water. $100,000 damage to buildings. Total crop loss in area 17 x 20 miles; estimated $350,000.
Ainsworth (3½ miles north-northwest), Nebr.	12	12:15 p. m.	100	0	10,000	Tornado and electrical.	Lightning struck and burned barn and contents. Tornado damage slight.
Perham and vicinity, Minn.	12	12:30 p. m.	[1] 5		500	Thundersqualls	Scaffolding at new bank building blown down; several trees uprooted and branches broken off; wires down.
Medicine Bow, Wyo.	12					Rain	1 small bridge washed out by flash flood.
Milwaukee, Wis.	13	2 a. m.				Electrical	Lightning set fire to dwelling. Fallen electric wire set fire to small garage. Chimney struck by lightning. Utility wires broken by falling tree limbs.

[1] Miles instead of yards.

SEVERE STORMS FOR JUNE 1949—Continued

Place	Date	Time	Width of path, yards	Loss of life	Value of property destroyed	Character of storm	Remarks
Nambe, N. Mex.	June 13	1 p. m.			$1,500	Hail and rain	Gardens and fruit main loss. Roofs and windows of some homes damaged.
Reedy and vicinity, W. Va.	13	5:30 p. m.				Electrical, rains, and winds.	Team of mules valued at $400 killed by lightning; barn damaged by fire set by lightning. Some damage to other buildings and to crops from rain and wind.
Crawford County (northeastern portion), Mo.	13	Night		1		Electrical	On farm 7 miles south of Sullivan lightning struck tree, killing youth.
Jacksonville, Tex.	14	11:30 a. m.	[1] 10		3,000	Wind	Many large trees broken, garage demolished, and many windows blown out.
Dayton, Liberty County, Tex.	14	2 p. m.	50		10,000	do	Most damage confined to 1 store; 2 other stores slightly damaged.
Endee, N. Mex.	14	4 p. m.			60,000	Hail	Grains total loss, estimated $60,000. Row crops will have to be replanted. Undetermined damage to buildings; every house in town will need reroofing; houses north of town badly damaged.
Spink, Beadle, and Kingsbury Counties, S. Dak.	15	2–4 p. m.	[1] 10			do	50 to 100 percent damage to crops.
Pipestone, Rock, and Nobles Counties, Minn.	15	8 p. m.	880		35,000	do	Moderate to heavy hail, that accompanied a severe thunderstorm, caused considerable damage to growing crops. A few fields of small grains a total loss.
Magic Reservoir, Blaine County, Idaho.	15	Late afternoon		2		Wind	Sudden, severe windstorm on backwaters of Magic Reservoir caused boat bearing 3 fisherman to capsize; 2 drowned.
Scott, Clark, and Washington Counties, Ind.	15				100,000	Rain and flash flood	Damage to crops estimated at $60,000; roads and dwellings, $40,000.
Grant and Morton Counties, N. Dak.	16	8 p. m.			150,000	Hail	Most damage in northeastern Grant County where some crops 100 percent loss.
Columbia Falls, Mont.	16					Wind	Damage to telephone lines.
Mike Horse, Mont.	16–17	3 p. m.–2 p. m.				Snow	Damage to power and telephone lines.
Bitterroot Valley, Mont.	16–17	6 p. m.				Rain and snow	Branches of shade and cherry trees broken by snow; large amount of hay bent over. Power lines broken.
Anaconda, Mont.	16–17	6 p. m.–9 a. m.	[1] 40			Snow	13 inches of snow. Some damage to roofs, trees, shrubs, hay and grain. At Georgetown Lake 16 miles west of Anaconda, 22 inches of snow reported, with considerable damage to forest.
Boulder, Mont.	16–17	9 p. m.				do	Wet snow broke trees, shrubs, and garden plants, and caused damage to power and telephone lines.
Deer Lodge, Mont.	16–17	11 p. m.–3 p. m.			2,500	do	Wet snow broke many shade trees, and caused death of freshly shorn sheep.
Philipsburg, Mont.	16–17					do	Damage to rural power lines in Flint Creek and Rock Creek Valleys from wet snow which accumulated up to 6 inches or more in diameter on wires.
Seattle, Wash.	17	4:11–5 p. m.				Thunderstorm	Small, occasional damage to windows and trees. 2 small boats capsized in Lake Washington; no lives lost. Strong convectional storm developed very rapidly with sudden wind shift from north to southeast. Extreme velocity, recorded at Seattle office, only 26 m. p. h. from southeast at 4:11 p. m. Reports of tornado not verified, twisting effect apparently resulting from wind shift.
Willmar and vicinity, Minn.	17	5:07 p. m.			25,000	Thundersqualls and hail.	A 200-foot radio tower toppled; several trees uprooted; poles and wires down; several barns blown down or unroofed; automobiles and farm machinery damaged. Light to moderate hail caused $10,000 damage to small grains, included in total.
Yuma, Colo.	17	5:30–5:55 p. m.	880	0	25,000	Tornado, hail, and rain.	Storm first struck 15 miles southwest of Yuma and moved in semicircle to northeast. Many farm buildings damaged by tornado. Heavy hail destroyed crops in spotted areas.
Eckley, Colo.	17	6 p. m.			18,000	Wind, hail, and rain.	Trees stripped of leaves and bark. Growing crops driven into ground.
Phoenix, Ariz.	17	6–7 p. m.	[1] 10			Thunderstorm and wind.	Power and telephone services disrupted as poles were blown down.
Wray, Colo.	17	6:30 p. m.			2,000	Wind, hail, and rain.	Principal damage to trees. Some crops destroyed by hail.
Dundy and Hitchcock Counties, Nebr.	17	8:30–10:30 p. m.	[1] 3–10		1,000	Hail and wind	Some windows broken, roofs damaged, cars dented, and many trees damaged.
Casa Grande and Eloy, Ariz.	17	Evening				Wind	30 telephone poles down on main line, disrupting El Paso-Yuma toll line.
Augusta and Rockingham Counties, Va.	17–18					Rain	Much damage and some loss of life by flooding.
Tucker, Pendleton, Grant, Hardy Counties, W. Va.	17–19; 27			5		Rains	Cloudbursts, giving up to 24 inches of accumulated rainfall, caused South Branch of Potomac River to rise rapidly to flood stages. Over 1,200 homes and business places reported damaged or destroyed; bridges washed away; over 100,000 poultry and livestock drowned and many more injured or marooned; crops ruined; automobiles caught in flood waters and damaged; communications and power services disrupted; water supplies contaminated; roads washed out; mountain slides covered lowlands with debris and changed courses of small streams. 7 or more persons missing in addition to 5 drowned. Property damage estimated at several million dollars.
Rawlins County, Kans.	18	Evening				Hail	Most destruction along 8-mile path at extreme north side of county. Storm moved eastward.
Hayden, Ariz.	18	Evening			50,000	Thunderstorm, wind, and flash flood.	Communication disrupted. Nearly 100 houses damaged. Number of trees and poles blown down. Several homes flooded by flash flood in canyon between Millside and Smelterside. Portion of roof blown off mill and smelter. A 6-car garage lifted from its foundation and demolished, portions of building carried 1 block by wind.
Secotan, Fla.	18		50	0	0	Tornado	Small twister in south end of Taylor County. A few trees broken and twisted off. Path short.
Ridgway, Mont.	19	Afternoon				Wind and hail	Crops damaged and small buildings blown over.
Ekalaka (northwest of), Mont.	19					Hail	Damage to grain, peas, beans, and beets.
Little Falls and vicinity, Minn.	20	6 a. m.	[1] 2		15,000	Thundersquall with hail.	A number of farm buildings demolished or otherwise damaged. Heavy hail damaged growing crops. $5,000 damage due to hail, included in total.
Greenville, Pa.	20	1:40–2:25 p. m.				Rain, wind, flash flood, and electrical.	Man knocked down when lightning struck church wall, toppling concrete block wall into recently built basement auditorium. High winds ripped trees and awnings, and sent an overhead crane at Steel Car plant off its track and onto ground. Water from flash flood reached depth of 4.5 to 5 feet on Stewart Ave., engulfing parked cars. For first time in memory of local residents, gushing torrents overflowed curbs and sidewalks, and flowed in front doors of several business places on Main Street. Observer reported 2.52 inches of rain fell in 45 minutes. Most water damage resulted when storm sewers became clogged.
Ute, Iowa	20	6:45 p. m.		1		Electrical	Farmer killed by a bolt of lightning while standing beneath a tree in a severe electrical storm. Another person, standing nearby, stunned and paralyzed for a short time. Storm accompanied by rain, hail, and high wind.

[1] Miles instead of yards.

SEVERE STORMS FOR JUNE 1949—Continued

Place	Date	Time	Width of path, yards	Loss of life	Value of property destroyed	Character of storm	Remarks
Sac City, Iowa	June 20	7 p. m.			$22,500	Wind	Struck Sac City Airport, 3 miles south of town. A cement block building damaged. 2 planes upset, with 1 completely demolished.
Putnam County (central portion), Mo.	20	Night				Electrical	Lightning struck and burned large barn west of Unionville. Electrical appliances at a home in town burned out by lightning.
Allegany, County, Md	20	P. m.				Cloudburst and floods.	A cloudburst broke over Dan's Mountain west of Cumberland, sending torrents of water into valley areas on both sides of the mountain. Traffic disrupted when many low points on highways inundated. Speedy waters carried huge rocks and tons of dirt from hills, depositing much of it on roads below. Some cellars flooded.
Argyle and vicinity, Minn.	20	P. m.	[1] 2½		70,000	Hail	Moderate to heavy hail, that accompanied a severe thunderstorm, caused much damage to growing crops. Small grains damaged from 10 to 100 percent.
Kermansville, Mich.	21	9—10:30 p. m.				Electrical, wind, and rain.	Several buildings wrecked. Over 2 inches of rain fell in 1½ hours.
Chouteau County, Mont.	21					Hail	Some damage to wheat over 3-mile path in the northwestern portion of county.
Sonnette, Mont.	21		[1] 10		100,000	do	Hail ½ to ¾ inch in diameter caused severe damage to wheat, oats, alfalfa, and native hay, completely destroying some fields. Windows broken, and buildings badly damaged. Gardens destroyed, and many chickens killed.
Lemington, Essex County, Vt.	21					do	Hailstones were from 1 inch up and seemed to be a fused mass of smaller stones, although still large hexagonal crystals of ice. Considerable damage to gardens and glass.
Omaha and vicinity, Nebr.	22	Midnight to late afternoon.	[1] 2		80,000	Hail and rain	Path 4 miles long. Heaviest damage to greenhouses. Some washing damage to streets.
Sanford, Fla.	22	7 a. m.			50	Electrical	2 houses struck by lightning.
Nelson (4 miles west), Nebr.	22	5:45 p. m.	880		2,500	Hail	Path approximately 3 miles long.
Gage County (northwestern portion), Nebr.	22	6–6:30 p. m.	[1] 4		75,000	do	Damage mostly to crops.
Auburn, Nebr.	22	7:30 p. m.			35,000	Wind	$30,000 damage to airplanes and hangar; $5,000 to other property.
Miami, Fla.	22	Night				Electrical	Woman burned by lightning which struck light cord on bed.
Naples, Cumberland County, Maine.	22	do.				Wind	Violent thunderstorm wind, described locally as a "twister", swept through narrow belt of town, felling trees and damaging light and telephone wires. A small roadside stand demolished.
Secotan, Fla.	22					Electrical	Lightning burned out about 200 yards of Forest Service telephone line over water.
Morgan County, Ill.	23	2:30 p. m.			100,000	Wind, hail, and rain	Storm most severe in northeastern part of county. Several buildings damaged by high winds. Many trees blown down, blocking traffic and disrupting utility services. Hail caused considerable damage to growing crops, mainly wheat, corn, and oats. Heavy rain.
Lincoln, Nebr.	23	Late afternoon and early evening.	[1] 4			Rain	Some basements flooded, widespread flooding of streets. Considerable damage to wires.
Ralls County (northeastern portion), Mo.	23	4:15–7:25 p. m.	[1] 15		4,200	Wind and rain	Minor damage to crops, some poultry loss, and some washouts on railroads and county roads. Crop loss estimated at $2,200, included in total. Area surrounding Saverton mostly affected.
De Witt, Iowa	23	9:45 p. m.				Wind	Several farmsteads 2 miles northeast of De Witt damaged. Small buildings overturned and trees uprooted. Telephone and power services disrupted. Many tree limbs downed in residential area.
Mountain Park, N. Mex.	24	1 p. m.			5,000	Hail	Crops and fruit damaged.
Cloud County, Kans.	24	3 p. m.	880			do	Storm occurred about 14 miles southwest of Concordia in path 1 mile long. A few fields damaged 25 percent.
Nodaway County (central portion), Mo.	24	5–5:15 p. m.	330	0	4,000	Tornadoes	Eyewitness reported 2 small funnel clouds estimated to be ¼ mile apart. 1 never quite touched ground, but the other after dipping several times, finally struck west and northeast Maryville in path over ½ mile long before dissipating. Considerable damage to windows, roofs, small outbuildings, trees, and to telephone and light wires and poles.
Iowa	24	Afternoon and evening.				Wind and rain	Thunderstorms, with heavy rain, hail, and strong winds, rather widespread. At Van Meter, 1.60 inches rain fell in an hour and winds uprooted many trees. At Mystic, near Centerville, heavy rains sent Walnut Creek over its banks in small flash flood. At Allendorf, east of Sibley, a torrential rain accompanied by hail flattened crops. A number of wires down in Des Moines from broken tree limbs.
Jackson and Pike Counties, Ohio.	24	Evening				Wind	Moderate damage to power and communication lines. Roof blown from 2 barns. Roads blocked by fallen trees.
Jackson and vicinity, Minn.	24	p. m.			20,000	Hail	Light to moderate hail, that accompanied a severe thunderstorm, damaged growing crops. Some fields of small grains damaged from 50 to 90 percent.
Fortine, Mont.	24					do	Damage to grain, gardens, and Christmas trees.
Minneapolis, St. Paul, and vicinity, Minn.	25	6 p. m.			55,000	Thundersqualls with hail.	3 barns blown down; many trees uprooted or branches broken off; wires down; 11 cows killed; city and farm buildings, and automobiles damaged. Hail damaged growing crops and property, especially greenhouses. Hail damage of $25,000, included in total.
Jacksonville Beach, Fla.	26	3 p. m.				Electrical	Lightning struck an electric power transformer controlling drawbridge between beaches and Jacksonville while bridge was lifted; service interrupted for an hour.
Seward County, Kans.	26	7–8 p. m.	[1] 7		150,000	Hail	Most damage over about 5 sections southwest of Liberal and 6 sections northeast of town. Stones size of walnuts. Damage to buildings, $25,000; wheat loss, $125,000. Path extended from north-central part of county south about 20 miles to near Oklahoma line.
Lane, Gove, and Scott Counties, Kans.	26	7–8 p. m.			25,000	Hail and wind	Path about 25 miles long over eastern Scott, southern Gove, and western Lane Counties. Hailstones ranged from less than ½ inch to over 3 inches in diameter. Little loss except to wheat.
Ohio, most of state	26	Evening				Wind and electrical	Barn destroyed by lightning near Columbus, estimated $10,000 damage. 6 persons injured by lightning at Ravenna and 1 near Columbus. Child injured by falling tree at Zanesville. Lightning did $75,000 damage to factory at Hamilton. 2 horses killed by lightning. Minor crop damage by wind.
Logansport, Ind.	26				500,000	Rain and flash flood; wind and hail.	Streets flooded; some houses surrounded by water. Wabash River did not overflow.
Washington County, Kans.	26–27	During night				Hail and rain	Occurred north of Hanover. Complete loss of wheat in some places.
Hillsboro (near), Wis.	27	A. m.				Electrical and wind	Phone and electric wires down. Tree limbs broken. 11 head of cattle killed by lightning.
Tennyson, Wyo.	27	2–3 p. m.				Hail	Crop damage estimated 10 to 30 percent in small area.
Windsor, Colo.	27	3–3:15 p. m.	[1] 2½		50,000	Hail and wind	Hailstones comparatively small, but wind driven; severe damage to small vegetation.
Cheyenne County (southwestern portion), Nebr.	27	5 p. m.	[1] 2			Hail	Path 12 miles long. Damage to wheat varied from little to total loss, but latter areas very small. Damage spotted.

[1] Miles instead of yards.

SEVERE STORMS FOR JUNE 1949—Continued

Place	Date	Time	Width of path, yards	Loss of life	Value of property destroyed	Character of storm	Remarks
Southeastern Nebraska	June 27	Late afternoon		1		Rain	Flooding caused severe damage to Omaha streets. Highway damage $16,000 to $20,000 in Douglas County. Man swept from stalled car and drowned in flash flood near Crab Orchard.
Cheyenne County, Kans.	27	7 p. m.	[1] 12		$1,000,000	Hail and wind	Damage extended east to west across county. Wind damaged roofs and broke glass in homes and business houses. Hail size of marbles. Complete loss of wheat in some areas.
Thomas County, Kans.	27	7-8 p. m. and 8:30-8:45 p. m.	[1] 5		250,000	do	Path of damage extended from Levant to Rexford, about 25 miles. The second hailstorm much more severe. Stones varied in size from small to 3 inches in diameter. High wind occurred after hail had fallen. Wheat chief loss, but other crops, roofs, and siding of houses, and store windows also damaged.
Thomas County, Kans.	27	7 p. m.	[1] 8		1,000,000	Hail	Northwestern portion of county hardest hit. Path southeastward 18 miles long. Hailstones ranged in size from ¼ inch to size of golf balls.
Sheridan County, Kans.	27	9:30-10 p. m.	[1] 2-4			Hail and wind	Damaging hail fell in the northwestern corner and southern half along path about 20 miles long. Hail size of golf balls. Storm moved eastward. Considerable wheat flattened by wind.
Ottawa County, Kans.	27	11 p. m.	[1] 1		12,000	Wind	Storm in and near Minneapolis resulted in some property loss and extensive damage to wheat by lodging. Telephone and power lines blown down.
Wheeling and vicinity, W. Va.	27	Evening			50,000	Rains and wind	City streets flooded. Carnival equipment suffered wind damage.
Iowa, western portion	27	Evening				Rain and hail	A torrential rain dumped nearly 4 inches of rain in downtown Council Bluffs and vicinity shortly after 6 p. m. Main street in Council Bluffs under 3 feet of water in places; many motorist stalled or temporarily trapped. Some hail fell in eastern part of town. In vicinity of Dow City in Crawford County, severe hailstorm shredded growing crops in area several miles wide and 6 miles long. Only a small acreage totally destroyed, as most crops expected to recover quickly.
Rawlins County, Kans.	27	Evening				Hail and wind	Area east and south of McDonald and Beardsly in west-central part of county damaged, mostly from hail. Wind broke trees, damaged power lines, and broke plate glass windows in some stores.
Washington County, Kans.	27	During night	[1] 2		3,500	do	Heavy wind and some hail flattened wheat in several communities just south of Greenleaf; path 3 or 4 miles long.
Berkshire County (northern portion), Mass.	27					Wind, electrical, and rain.	Trees blown down across power and telephone lines by winds estimated at 45 m. p. h. Lightning struck transformers crippling electric service for several hours. Some main streets in North Adams flooded to depth of 1 foot by heavy rain.
Mitchell and Cloud Counties, Kans.	27-28	9:10 p. m.-2 a. m.			750,000	Wind and hail	Damage from Beloit to northeast portion of Cloud County. Hail areas not clearly defined. Several funnel-shaped clouds observed from 10 to 10:30 p. m., but none reached ground. Much wheat matted to ground by high wind and very heavy rain. Loss of wheat, corn, oats, and alfalfa estimated at $600,000 included in total. Some property damage from wind.
Dickinson County, Kans.	28	2 a. m.	[1] 1		25,000	Wind	Storm of near tornadic violence began near Herington and traveled north for about 10 miles, causing considerable property and crop damage. Roofs blown off; plate glass windows broken; trees, power and telephone lines blown down. Small grain flattened.
South Bend and Mishawaka, Ind.	28	1 p. m.			5,000	do	Trees and wires down.
Carroll and Cass Counties, Ind.	28	4 p. m.	[1] 2		1,100	Wind and hail	Hail up to ¼ inch in diameter; $1,000 damage to crops included in total.
Good Hope, Horry County, S. C.	28	4 p. m.		1		Electrical	Child struck by lightning and killed.
Upper Stewarts Creek and Hinzman Run Valleys between Linn and Glenville, W. Va.	28	6-8 p. m.			17,000	Rains	Flash flood washed away and destroyed a house, washed away garage, undermined house foundation, destroyed outbuildings, ruined crops, did minor damage to roads, and destroyed livestock and poultry.
Belmont County, Ohio	28	6:20 p. m.			15,000	Wind and electrical	Trees and wires blown down. Minor lightning and hail damage.
Conrad, Mont.	28					Wind	Trees broken.
Lincoln (northeastern portion), Nebr.	29	5 a. m.			30,000	Electrical	Grocery store struck and set afire; interior and contents destroyed.
Saco (near), Mont.	29	5:45 p. m.		1		Wind	Aviator killed, and passenger seriously injured in plane crash.
Ingham and Livingston Counties, Mich.	29	Afternoon				Electrical, wind, rain, and hail.	Storm struck Williamston, destroying shed and 9 hogs, and burned barn. 2 barns near Mason, and 1 house near Howell struck by lightning and burned.
Vega, Oldham County, Tex.	29	6 p. m.	[1] 3		3,000	Wind and hail	Wheat downed. Wind damage, $600; hail, $2,400.
North Dakota, entire State	29	Early evening			120,000	Wind	Many farm buildings and some crops damaged, mostly in northeastern part of State. Damage to buildings, $90,000; damage to crops, $30,000.
Cumberland and vicinity, Md.	29	P. m.				Rains, wind, and electrical.	Termed by some as cloudburst, with measured fall of 2.42 inches in Cumberland. Heavy rains, lightning, and winds combined to disrupt at least 2,000 telephones, paralyze fire department's communication system, and damage trees, shrubbery and streets.
Telegraph Creek, Mont.	29		[1] 5-10		2,000	Wind	Small buildings and roofs damaged, 2 granaries moved; haystacks damaged; some poultry killed.
Glasgow, Mont.	29				10,000	do	Wind, reaching peaks of 55 m. p. h., blew rocks through windows, damaged roofs, blew signs over, and caused complete loss of airplane and damage to another.
Polk County, Minn.	30	1 a. m.			30,000	Thundersquall	Several barns and outbuildings demolished; many buildings damaged; poles and wires down; trees uprooted or branches broken off; signs, billboards, and awnings torn away; growing crops damaged.
Stanley, Wis.	30			1		Electrical	Death by lightning.
Phillips (near), Wis.	30			1		do	Do.

[1] Miles instead of yards.

LATE STORM REPORTS FOR MARCH, APRIL, AND MAY 1949

Place	Date	Time	Width of path, yards	Loss of life	Value of property destroyed	Character of storm	Remarks
Columbia (6 miles southeast), S. C.	March 9	4:30 p. m.		1	$3,000	Electrical	A bolt of lightning struck 1 person and destroyed home by fire.
Iowa, northwestern half	April 14					Snow	Heavy snowstorm accompanied by 40 m. p. h. northerly winds. Falls of 6 to 8 inches general over wide area from Woodbury County to Winneshiek County. Highways temporarily blocked by drifts 3 to 4 feet deep; many motorists marooned 6 to 24 hours. Most damage confined to power and telephone lines. One of the 4 greatest snowstorms of record for so late in the season. Snow provided needed moisture for small grain and spring seedings.
Claiborne Parish, La.	May 1	5 p. m.		0	25,000	Tornado	Path about 4 miles south of Homer. 12 persons injured. 5 homes and 4 barns destroyed. Storm crossed oil field, but did little damage.
Wilkes-Barre and Wyoming Valley, Pa.	5	4–6 p. m.			50,000	Electrical and wind	Overhead coal conveyor line broken by wind; fell across Lehigh Valley R. R. tracks, interrupting traffic for 1 hour. 2 fires caused by lightning. 2-story building badly damaged by lightning and resultant fire. Many trees, signs, and 2 television antennas blown down.
Duncannon, Pa.	5	4:45–5 p. m.			30,000	Thunderstorms	Three converging storms unroofed house and carried roof 500 feet, landing it on top of garage so that it looked as if it fit and belonged there. Another house and apartment unroofed. At least 75 large trees blown down, 1 onto house where branches went through roof and 1st floor ceiling and pushed stove through floor to basement. 3 barns partly demolished, silo blown down, livestock injured. Power lines down, with 1 small fire resulting. Sewer pipe ruptured when big tree uprooted. Traffic delayed for ½ hour due to debris-laden streets.
Wilkes-Barre and vicinity, Pa.	6	5:30–9:30 p. m.			25,000	Electrical	Series of 3 thunderstorms. Lightning caused numerous fires, 3 barns on 2 farms destroyed. Transformer hit by lightning. Power and telephone lines downed.
Philadelphia and vicinity, Pa.	7	2–6 p. m.		1		Electrical and hail	Hail damaged fabric on 10 airplanes at North Philadelphia Airport and on 2 airplanes at Flying Dutchman Airport at Somerton. Hundreds of panes of glass in greenhouses broken and hundreds of plants damaged by hail. Hailstones so large and numerous that golfers unable to find their golf balls among them. Some hailstones as large as hens' eggs. Farmer killed when struck by lighting.
Cheyenne, Wyo.	20	12:45 p. m.		0	0	Tornado	Funnel sighted, but did not reach ground.
Sumner County, Kans.	20	8–9 p. m.	880		25,000	Hail and wind	Heavy hail fell over path 3 miles long, about 1 mile west of Mayfield. Principal damage to crops. High wind in a number of other localities over county, uprooted trees and broke power and telephone wires.
Zelienople, Altoona, and Johnstown, Pa.	22	4 p. m.		1		Tornadoes and thunderstorms.	Violent storm sweeping from southwest produced 2 twisters. One cut 100-yard-wide path in South Zelienople. Other swept down Carson Valley into southwest section of Altoona. In South Zelienople small buildings at Lutheran Old Peoples Home and Orphanage damaged. Storm preceded by rain, and hail "as big as cherries." Combination garage and workshop leveled, with damage of $4,000. A dog and chickens were thrown through the air as a shed toppled over. A cow badly injured and had to be destroyed. At Harmony Junction, 3 miles outside Zelienople, high winds and rain knocked out about 6,000 window panes of greenhouse. Roof lifted off house. Foundation of garage moved, damaging new car. A 64-year-old man electrocuted near Johnstown, when he tried to pick up fallen "live" wire. 3 others in that area hurt, when tree fell on car. All electric and power lines south of Johnstown down. In Johnstown area, man injured when tree struck by lightning fell on him; another stunned when lightning struck his home. Large barn flattened near Lloyddell, killing 2 sheep. Roofs of 2 barns torn off near Boswell. (This information is additional to damage reported in MAY MONTHLY WEATHER REVIEW for storm in Beaver and Butler Counties, Pa., on May 22.)
Masontown, Uniontown, and Dunbar, Pa.	22	4:30–5:30 p. m.	[1] 12			Wind, hail, and electrical.	Storm from southwest; path 20 miles long. Storm lasted barely 15 minutes at each individual spot, but took about 1 hour to cross whole area. 2 persons in Uniontown stunned by lightning. Fire, started by lightning, destroyed 2-story frame house near Point Marion. Damage estimated $12,000. Telephone and power lines downed; some out of service throughout night. Storm first hit near Ronco, attended by heavy hail. Storm from west entered Uniontown, covering entire city. Storage building at Connellsville Airport capsized and blown 75 feet. Garage near Dunbar unroofed. Roads blocked by fallen trees, and some property damage from fallen trees. 2 trees uprooted, silo blown down, and part of roof blown off barn near Waynesburg. Garages and other small buildings destroyed, trees uprooted, roofs torn off, chimneys knocked down, windows broken in all parts of Uniontown. Tall smoke stack doubled over. Large frame barn damaged. Downtown streets inundated to depth of several inches at height of storm, with lumber from a lumber company being swept across road by water.
Lehigh, Berks, and Northampton Counties, Pa.	22	7:30–9:30 p. m.		0		Tornado, hail, and electrical.	At Hosensack 2 persons injured, and 5 chicken houses containing 5,200 chickens demolished by tornado. Many power failures and many trees blown down. Lightning set fire to 1 house in Allentown. Gusts reached 85 m. p. h. at Allentown-Bethlehem-Easton Airport. Garage demolished at Coopersburg, but car inside barely scratched. Hail at Coopersburg. 3 barns smashed along Limeport-Steinsburg road. 4 poultry houses smashed at Wescoville. House unroofed at Lenhartsville. 1 mile north of Allentown, a war-surplus glider carried up and over a 1-story building and dropped upside down on highway. Many roads temporarily blocked by fallen trees, utility poles, and "hot" wires. Telephone and electric services disrupted for several hours.

[1] Miles instead of yards.

LATE STORM REPORTS FOR MARCH, APRIL, AND MAY 1949—Continued

Place	Date	Time	Width of path, yards	Loss of life	Value of property destroyed	Character of storm	Remarks
Clayton, Pa.	May 22	7:30–9:30 p. m.		0		Tornado and thunderstorm.	Huge barn wrecked. At a hosiery mill rear wall blown in, front wall blown out, and roof caved in. Nearby 3 homes damaged, and 2-story garage demolished. 5 persons injured when 3-story house was unroofed. Several other houses partly unroofed and otherwise damaged in Bally-Clayton area. In Palm, a stone house unroofed and stone walls badly cracked. Another stone house partly unroofed. 100-year old trees uprooted and twisted. Barn unroofed and twisted. Wind shift clouds at Pottstown from 8:30 to 8:50 p. m. were dull orange color.
Harrisburg and Hummelstown, Pa.	22	8:30–9:30 p. m.		0		Tornadoes and thunderstorms.	High winds, heavy rain, ¾-inch hailstones, and at least 1 small twister moved eastward. Strong winds blew down many big trees in River Park, completely blocking Front Street for 15–20 blocks. House roof blown off, felling several light poles and sideswiping other homes. Several cars damaged by trees falling on them. Signs and small stands damaged store windows. Fallen power lines resulted in several spot fires, causing limited property damage. Near Hummelstown, side of stone house blown out; several barns unroofed. A partially finished home demolished and another new home blown down. Roof of grocery store blown through air about 75 feet, damaging home. Highways near Hummelstown, Annville, and Lebanon, and locally in Harrisburg closed to auto traffic for several hours, until fallen trees and debris could be cleared.

SOLAR RADIATION DATA FOR JUNE 1949

Explanation of tables 1 and 2 and references to descriptions of instruments, stations, and methods of observation, and to summaries of data, are given in the MONTHLY WEATHER REVIEW, volume 72, No. 1, January 1944, page 43. A list of pyrheliometric stations is given on page 45 of that issue. An explanation of the formula used in computing the air mass values for each station listed in table 1 appears in volume 75, No. 3, March 1947, page 47.

A new solar radiation station has been established at the weather station of the Thomson Laboratory, General Electric Co., 920 Western Avenue, West Lynn, Mass. The station is sponsored by the General Electric Company and is under the supervision of Mr. A. E. Spaulding. An Eppley 180° pyrheliometer and Brown strip-chart potentiometer are used. The coordinates of the station are: latitude 42°27′; longitude 70°58′; elevation 23 meters above m. s. l. Observations to the horizon are unusually free of any important obstructions. Beginning with this issue, daily totals and weekly means of total solar and sky radiation received on a horizontal surface will appear regularly in table 2. The station will be designated in the table as "Lynn, Mass."

Values of data in table 2 for Ithaca, N. Y., appear to be too low and publication of data for that station is being temporarily discontinued until an inspection and instrumental check-up can be made.

It has been decided to withhold or discontinue publication of data from a number of newly established stations until official inspection will have been made. Therefore, beginning with this issue, stations located at San Antonio, Tex., Fort Worth, Tex., Santa Maria, Calif., Las Vegas, Nev., Albany, N. Y., and Portland, Maine are temporarily dropped from the list in table 2.

TABLE 1.—*Solar radiation intensities during June 1949*

[Gram calories per minute per square centimeter of normal surface]

Date	Sun's zenith distance									Vapor pressure	
	A. M.				0.0°	P. M.					
	78.7°	75.7°	70.7°	60.0°		60.0°	70.7°	75.7°	78.7°	7:30 a. m.[1]	1:30 p. m.[1]
MADISON, WIS.											
	Air mass										
	4.81	3.84	2.88	1.92	*0.96	1.92	2.88	3.84	4.81		
June	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mb.*	*mb.*
6	0.75	0.79	0.84	1.06	1.30	1.06	.....	.....	.....	14.8	8.7
7	.80	.90	1.02	1.15	1.36	.13	.....	.....	.....	8.7	7.4
9	.41	.58	.74	.90	.....	.....	.....	.....	.....	9.4	8.7
11	.38	.48	.64	.53	.77	.....	.....	.....	.....	14.8	14.2
16	.49	.59	.74	.88	1.22	.....	.....	.....	.....	15.8	13.7
18	.31	.41	.44	.76	.96	.....	.....	.....	.....	21.8	22.6
19	.....	.....	.....	.84	.....	.79	.....	.....	.....	18.3	22.6
22	.65	.75	.87	1.04	1.20	.....	.....	.....	.....	16.5	12.3
27	.66	.76	.86	1.06	1.16	.....	.....	.....	.....	19.0	19.0
29	.65	.74	.83	.95	1.17	.94	.....	.....	.....	19.0	21.8
30	.33	.44	.58	.77	.99	.....	.....	.....	.....	20.4	28.6
Means	.54	.64	.76	.90	1.13	.98	.....	.....	.....	.....	.....
Departures	−.08	−.12	−.13	−.13	−.18	−.09	.....	.....	.....	.....	.....

TABLE 1.—*Solar radiation intensities during June 1949*—Continued

Date	Sun's zenith distance									Vapor pressure	
	A. M.				0.0°	P. M.					
	78.7°	75.7°	70.7°	60.0°		60.0°	70.7°	75.7°	78.7°	7:30 a. m.[1]	1:30 p. m.[1]
TABLE MOUNTAIN, CALIF.											
	Air mass										
	3.76	3.01	2.26	1.51	*0.75	1.51	2.26	3.01	3.76		
June	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mb.*	*mb.*
2	1.05	1.13	1.24	1.37	.....	.....	.....	.....	.....	.....	.....
7	.91	1.01	1.14	1.29	.....	.....	.....	.....	.....	.....	.....
9	.....	.....	.....	1.30	.....	.....	.....	.....	.....	.....	.....
13	.....	.....	.....	1.27	.....	.....	.....	.....	.....	.....	.....
24	1.03	1.12	1.22	1.36	.....	.....	.....	.....	.....	.....	.....
26	.....	.....	.....	1.41	.....	.....	.....	.....	.....	.....	.....
27	.....	.....	.....	1.40	.....	.....	.....	.....	.....	.....	.....
29	1.15	1.23	1.33	1.44	.....	.....	.....	.....	.....	.....	.....
30	.....	.....	.....	1.45	.....	.....	.....	.....	.....	.....	.....
Means	1.04	1.12	1.23	1.37	.....	.....	.....	.....	.....	.....	.....
Departures	+.01	.00	.00	+.01	.....	.....	.....	.....	.....	.....	.....
BLUE HILL, MASS.											
	Air mass										
	4.86	3.89	2.92	1.94	*0.97	1.94	2.92	3.89	4.86		
June	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mb.*	*mb.*
2	.....	0.77	0.90	1.09	.....	.....	.....	.....	.....	11.5	10.9
3	0.50	.61	.78	.99	1.32	1.18	1.01	0.90	.....	9.8	8.4
4	.....	.....	.72	.99	1.43	1.15	.99	.85	.....	14.9	13.7
5	.....	.....	.....	.91	.....	.....	.....	.....	.....	19.4	22.9
6	.....	.96	1.09	1.24	.....	1.12	1.03	.88	.78	13.0	10.5
7	.....	.....	.....	.....	.....	1.07	.....	.....	.....	12.5	9.9
8	.....	.....	.....	1.22	.....	1.23	1.07	.94	.83	6.7	8.3
9	.....	.....	.....	.....	.....	.....	.97	.....	.....	9.6	9.6
13	.43	.52	.64	.86	1.19	.96	.77	.65	.55	21.0	20.7
15	.....	.....	.....	.....	.....	1.08	.85	.77	.67	20.9	19.4
16	.....	.....	.....	.....	.....	.....	.99	.84	.75	21.2	18.1
17	.....	.....	.....	.....	.....	1.03	.92	.....	.....	23.4	24.5
18	.....	.....	.....	.....	.....	.....	.93	.83	.73	23.7	22.4
23	.....	.....	.....	1.07	.....	1.16	1.00	.87	.76	15.1	12.8
26	.....	.....	.....	.98	.....	1.06	.95	.....	.....	26.6	20.6
Means	.46	.72	.83	1.04	1.31	1.10	.96	.84	.72	.....	.....
Departures	−.19	−.03	−.06	.00	.00	+.05	+.11	+.14	+.13	.....	.....
LINCOLN, NEBR.											
	Air mass										
	4.77	3.81	2.86	1.91	*0.95	1.91	2.86	3.81	4.77		
June	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mb.*	*mb.*
15	.....	.....	.....	.....	1.15	0.90	.....	.....	.....	15.3	16.4
16	.....	.....	.....	.....	1.26	.94	0.77	0.64	0.54	15.3	19.6
17	.....	.....	.....	.....	1.22	.88	.64	.50	.37	18.3	21.8
21	.....	.....	.....	.....	1.33	1.08	.90	.79	.69	22.6	19.0
28	.....	.....	.....	.....	1.36	1.14	.99	.86	.77	21.8	19.6
30	.....	.....	.....	.....	1.24	.88	.71	.....	.....	23.4	26.8
Means	.....	.....	.....	.....	1.26	0.97	0.80	0.70	0.59	.....	.....
Departures	.....	.....	.....	.....	−.09	−.12	−.10	−.07	−.07	.....	.....

*Extrapolated.

[1] 75th meridian time.

TABLE 2.—*Daily totals and weekly means of solar radiation (direct + diffuse) received on a horizontal surface during June 1949*

[Gram-calories per square centimeter]

Date	Honolulu, T. H.	Pearl Harbor, T. H.	La Jolla, Calif.	Riverside, Calif.	Nashville, Tenn.	Fresno, Calif.	Davis, Calif.	Washington, D. C.	Columbia, Mo.	Soda Springs, Calif.	Seabrook, N. J.	Grand Lake, Colo.	New York, N. Y.	Salt Lake City, Utah	State College, Pa.	Lincoln, Nebr.	Newport, R. I.	Put-in-Bay, Ohio	East Wareham, Mass.	Blue Hill, Mass.	Boston, Mass.	Lynn, Mass.	Twin Falls, Idaho	East Lansing, Mich.	Madison, Wis.	Toronto, Canada	Summit, Mont.	Fairbanks, Alaska
1949																												
June 4	734	622	667	-----	563	763	782	647	615	838	651	292	652	329	771	244	785	690	728	774	703	719	745	-----	722	461	747	342
June 5	755	685	654	-----	525	755	718	458	566	678	540	618	494	500	628	263	426	754	540	608	502	520	700	-----	744	708	748	411
June 6	797	710	648	-----	714	576	728	699	524	506	696	273	624	365	763	528	777	685	710	793	724	720	687	-----	769	530	700	564
June 7	581	690	615	-----	715	779	717	454	720	779	585	418	676	652	798	269	728	776	696	682	632	659	688	-----	795	735	756	570
June 8	706	659	647	-----	713	798	746	763	390	816	762	337	757	664	829	323	708	753	656	728	649	603	597	-----	682	712	(762)	396
June 9	705	686	596	664	567	778	741	678	404	811	656	378	699	725	773	288	718	710	686	723	688	642	713	-----	721	705	561	654
June 10	774	606	331	498	419	749	701	517	290	820	595	535	568	726	648	348	767	626	712	688	612	566	682	-----	638	583	734	616
Means	722	666	594	-----	602	743	733	602	502	750	641	407	638	566	744	323	701	713	675	714	644	633	684	-----	724	633	715	507
Departures	+80	+78	+54	-----	+45	+60	+73	+86	−67	+26	-----	−87	+146	−26	+220	−186	+154	+147	+157	+192	+171	-----	+106	-----	+210	+29	+115	+1
June 11	541	466	238	538	429	796	749	514	638	838	387	540	593	491	536	604	678	651	640	701	624	625	708	-----	687	580	776	418
June 12	486	346	528	560	447	799	745	614	-----	808	733	435	615	740	713	428	676	574	574	547	552	547	743	-----	664	609	621	702
June 13	311	320	252	585	337	773	733	470	356	810	613	437	434	766	738	128	663	569	655	722	654	653	746	-----	249	573	788	626
June 14	648	584	317	568	103	744	723	670	267	806	729	614	468	725	445	471	714	504	704	520	530	406	718	-----	131	515	730	214
June 15	652	423	253	607	130	783	727	489	776	819	655	696	668	739	590	700	776	374	706	632	620	544	735	-----	563	633	477	634
June 16	671	655	340	626	345	771	728	354	783	830	573	784	590	611	420	684	765	347	679	695	593	634	733	-----	755	529	493	-----
June 17	572	654	634	647	607	786	662	138	800	(706)	472	636	324	724	143	706	743	200	690	590	616	577	585	-----	618	414	370	354
Means	554	493	366	590	343	779	724	464	603	802	595	592	527	685	512	532	716	460	664	630	598	570	710	-----	524	550	608	491
Departures	−60	−49	−156	−3	−160	+71	−4	−38	+40	+23	-----	+38	+49	+40	+47	−7	+202	−64	+142	+136	+126	-----	+97	-----	+25	−12	−6	−21
June 18	664	573	549	650	314	350	413	103	665	357	219	327	494	510	212	159	759	636	691	572	485	661	549	-----	661	474	691	408
June 19	667	527	673	648	584	770	732	305	681	810	493	708	440	653	314	304	701	684	615	508	529	508	362	-----	630	628	590	162
June 20	342	356	700	688	507	796	695	408	605	825	533	716	407	732	647	665	725	694	613	577	501	534	742	-----	701	520	667	234
June 21	568	389	588	614	504	784	727	629	557	838	614	801	545	766	618	740	642	606	585	599	559	533	741	-----	551	331	560	624
June 22	704	647	611	627	645	714	728	529	785	831	497	690	486	704	667	642	451	751	348	387	394	408	736	-----	707	725	(508)	245
June 23	703	663	643	625	744	811	720	717	644	851	776	383	776	440	772	555	789	670	687	775	735	737	719	-----	506	512	404	615
June 24	723	460	441	624	601	798	686	634	470	822	701	756	591	696	710	294	757	663	663	682	611	579	733	-----	353	431	245	270
Means	624	516	601	640	557	718	672	475	629	762	547	626	534	643	563	480	689	672	600	586	545	566	655	-----	587	517	523	367
Departures	+22	−10	+38	+36	+11	00	−29	−27	+66	−24	-----	−23	+47	−4	+29	−85	+134	+74	+90	+48	+91	-----	+1	-----	+53	−1	−33	−136
June 25	530	600	514	500	510	777	806	368	651	786	569	804	482	663	560	769	406	530	369	577	531	464	737	-----	512	166	605	276
June 26	562	504	232	346	564	810	696	622	432	838	535	632	667	434	419	732	726	340	673	764	698	726	710	-----	601	661	423	395
June 27	538	487	362	494	340	818	720	535	621	835	490	771	411	713	307	415	456	625	330	376	386	426	738	-----	707	645	543	294
June 28	590	624	497	449	360	808	690	152	528	835	162	791	507	707	466	741	466	690	581	603	702	739	522	-----	393	597	568	372
June 29	687	614	460	685	642	812	696	167	624	758	479	859	653	675	207	632	746	609	707	745	678	706	658	-----	702	201	281	516
June 30	641	585	441	662	668	793	718	272	776	833	433	737	329	572	518	718	427	629	538	600	548	565	736	-----	646	563	(802)	575
July 1	692	641	308	406	664	770	677	361	-----	848	451	669	553	559	740	621	735	665	509	650	638	632	725	-----	491	582	762	280
Means	606	579	402	506	536	798	715	354	605	819	446	752	515	618	459	661	566	584	530	616	597	608	689	-----	579	488	569	380
Departures	−11	+11	−107	−85	−1	+85	−10	−172	+20	+30	-----	+57	+30	−28	−60	+66	+17	−2	+26	+101	+109	-----	+55	-----	+32	−16	−23	−74

ACCUMULATED DEPARTURES ON JULY 1, 1949

	+294	+252	{−6965}	----	{+2625}	+6664	+1344	−1687	----	+798	-----	-----	-----	−392	{+5817}	−4907	+5075	+6958	+3213	+5474	+6188	----	{+2793}	----	{+5355}	+497	+357	----

NOTE.—Data in parentheses are interpolated.

TABLE 3.—*Daily totals and weekly means of solar and sky radiation plus the radiation reflected from the ground, as received on a vertical surface facing south at Blue Hill, Mass. during June 1949*

Date	4	5	6	7	8	9	10	Mean	11	12	13	14	15	16	17	Mean	18	19	20	21	22	23	24	Mean
Gm cal cm^{-2}	273	266	266	271	258	241	256	262	254	200	248	206	218	225	202	222	212	180	217	224	140	232	233	206

Date	25	26	27	28	29	30	1	Mean
Gm cal cm^{-2}	224	235	166	228	253	248	251	229

U. S. GOVERNMENT PRINTING OFFICE: 1949

Chart I. Departure (°F.) of the Mean Temperature from the Normal, and Wind Roses for Selected Stations, June 1949

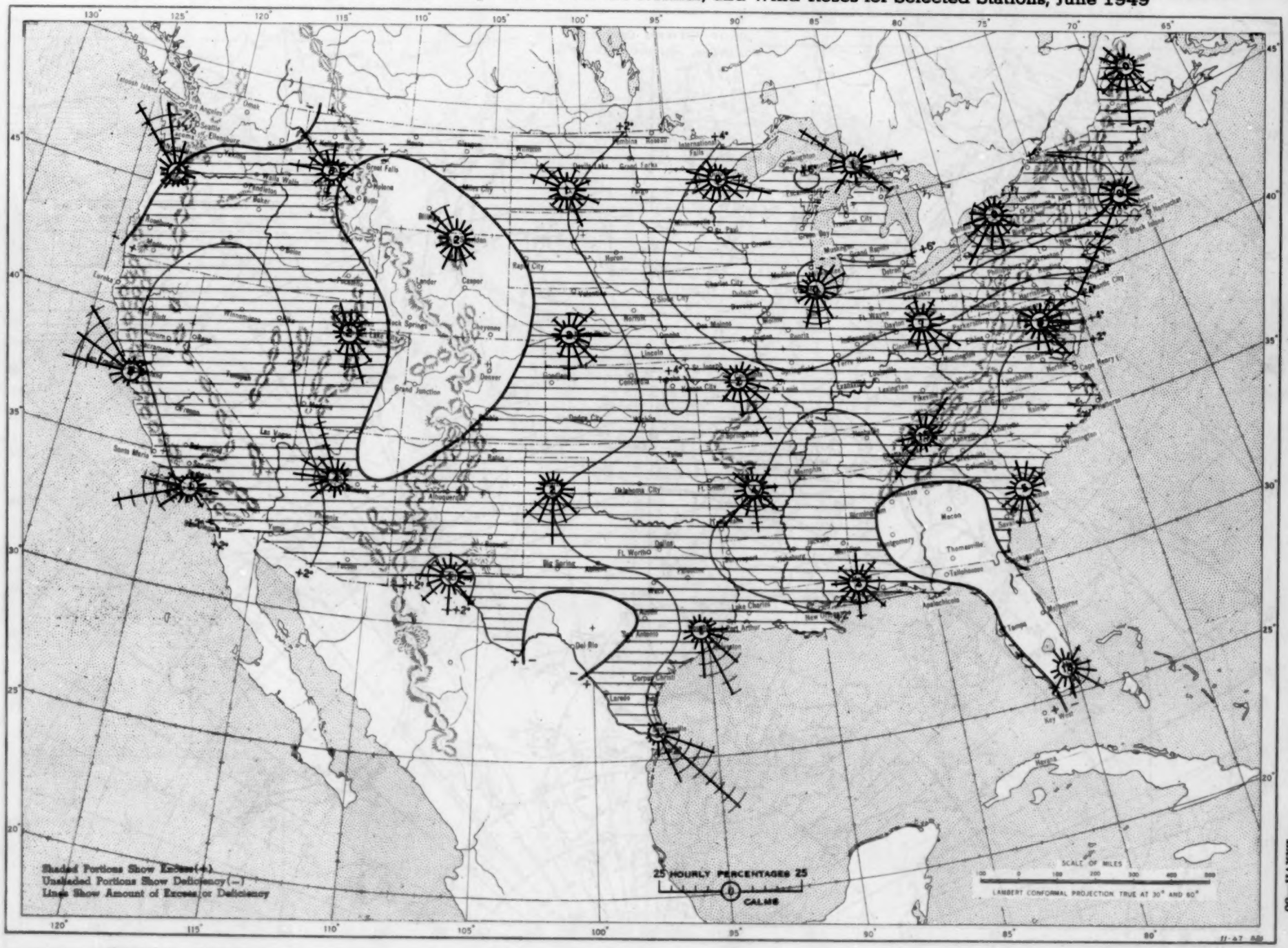
Shaded Portions Show Excess (+)
Unshaded Portions Show Deficiency (−)
Lines Show Amount of Excess or Deficiency
25 HOURLY PERCENTAGES 25
CALMS
SCALE OF MILES
LAMBERT CONFORMAL PROJECTION TRUE AT 30° AND 60°

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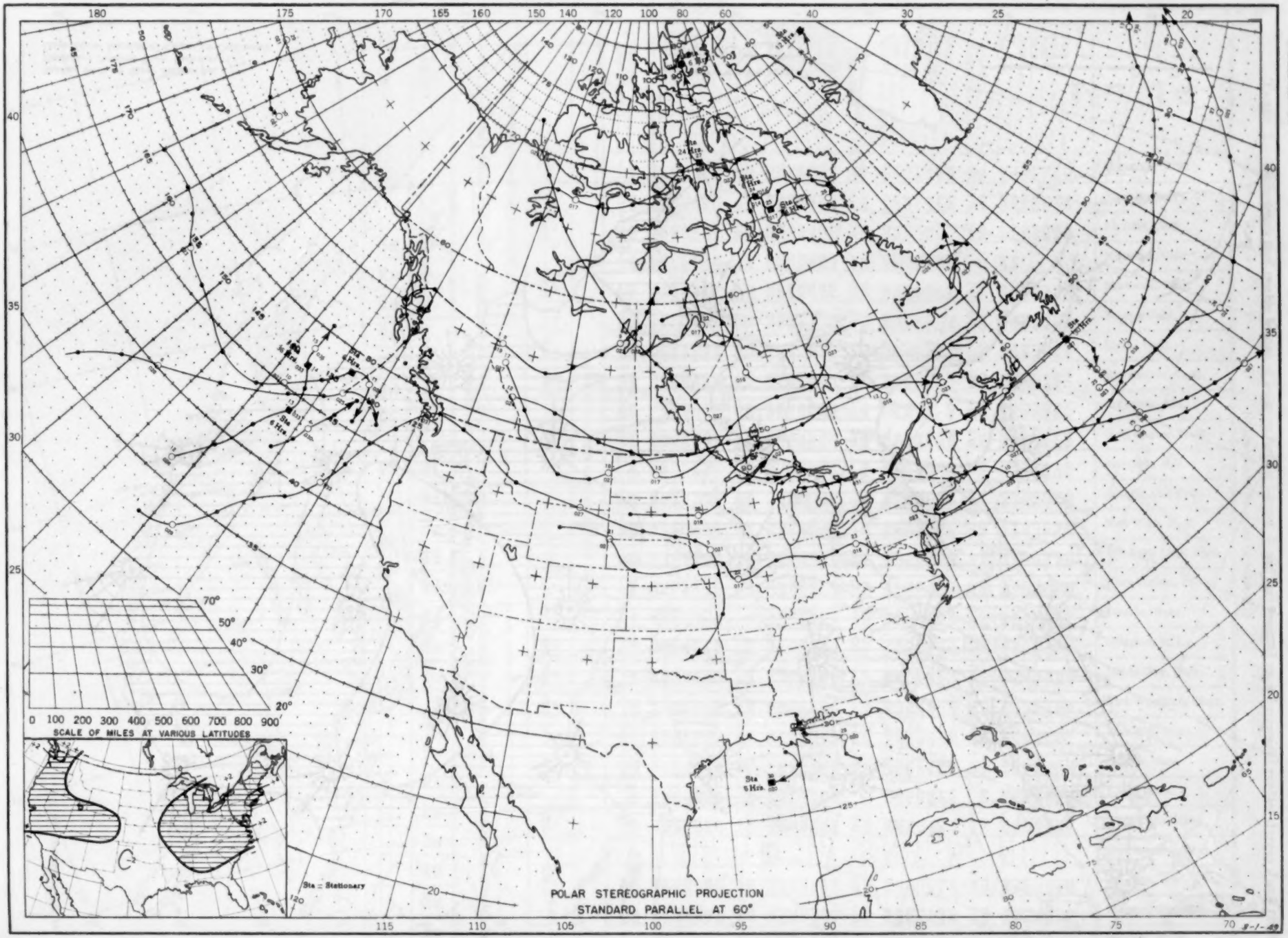
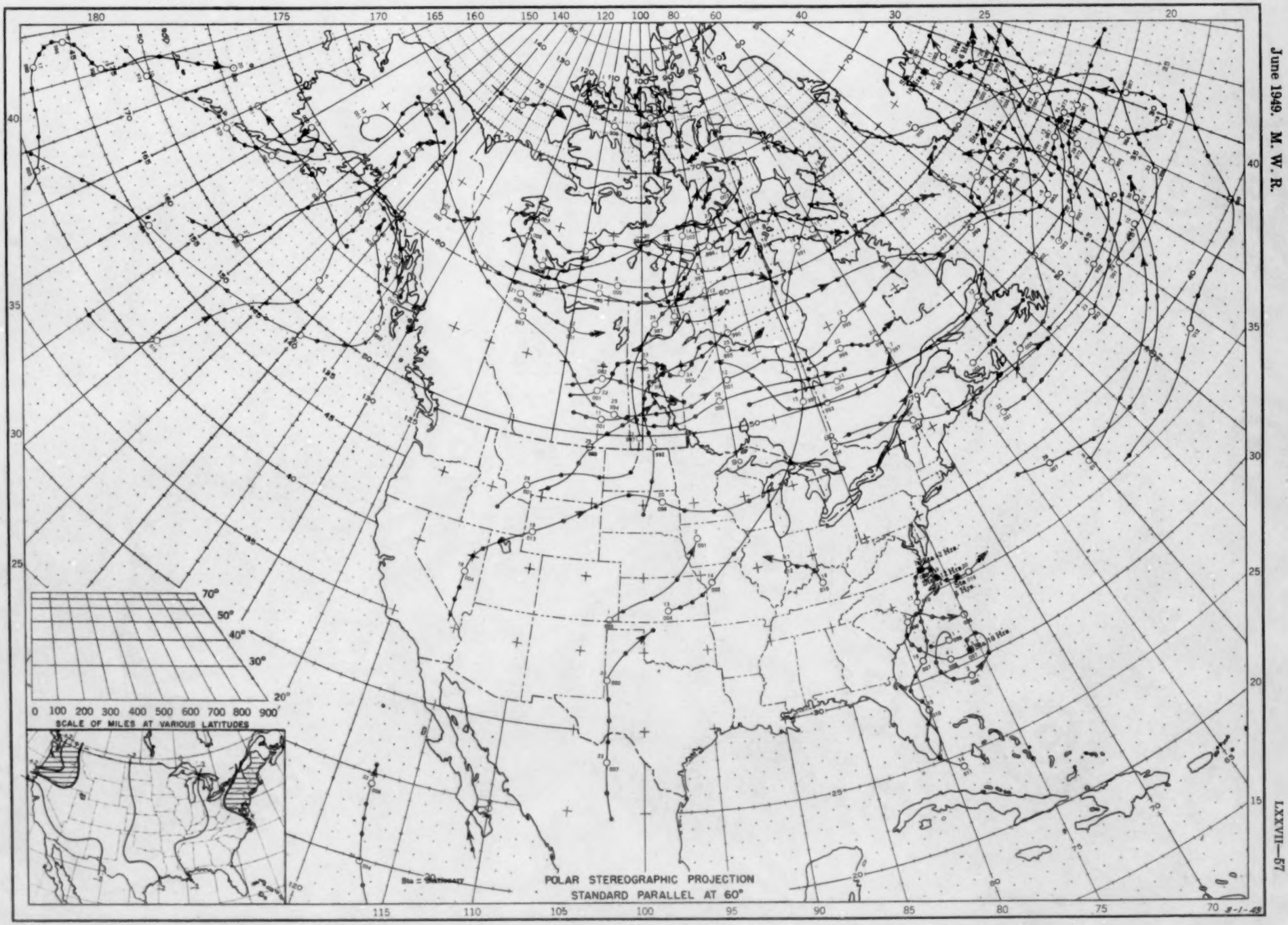
Chart II. Tracks of Centers of Anticyclones, June 1949. (Inset) Departure of Monthly Mean Pressure from Normal



Circle indicates position of anticyclone at 7:30 a. m. (75th meridian time). Dots indicate intervening 6-hourly positions. Figure above circle indicates date, and figure below, pressure to nearest millibar. Only those centers which could be identified for 24 hours or more are included.

Circle indicates position of anticyclone at 7:30 a. m. (75th meridian time). Dots indicate intervening 6-hourly positions. Figure above circle indicates date, and figure below, pressure to nearest millibar. Only those centers which could be identified for 24 hours or more are included.

Chart III. Tracks of Centers of Cyclones, June 1949. (Inset) Change in Mean Pressure from Preceding Month



Circle indicates position of cyclone at 7:30 a. m. (75th meridian time) Dots indicate intervening 6-hourly positions. Figure above circle indicates date, and figure below, pressure to nearest millibar. Only those centers which could be identified for 24 hours or more are included.

Chart IV. Percentage of Clear Sky Between Sunrise and Sunset, June 1949

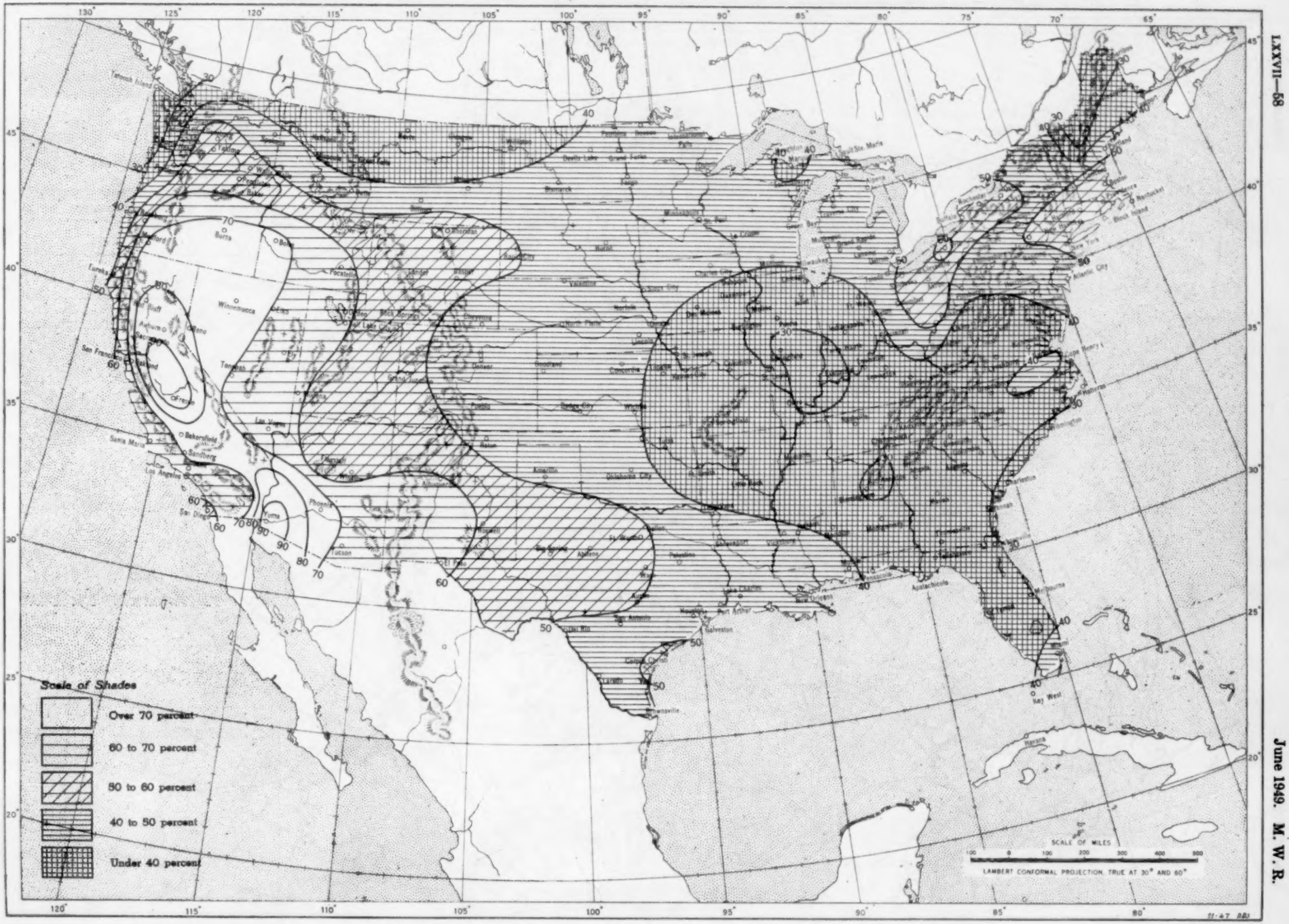

Scale of Shades
Over 70 percent
60 to 70 percent
50 to 60 percent
40 to 50 percent
Under 40 percent
SCALE OF MILES
LAMBERT CONFORMAL PROJECTION, TRUE AT 30° AND 60°

Chart V. Total Precipitation, Inches, June 1949. (Inset) Departure of Precipitation from Normal

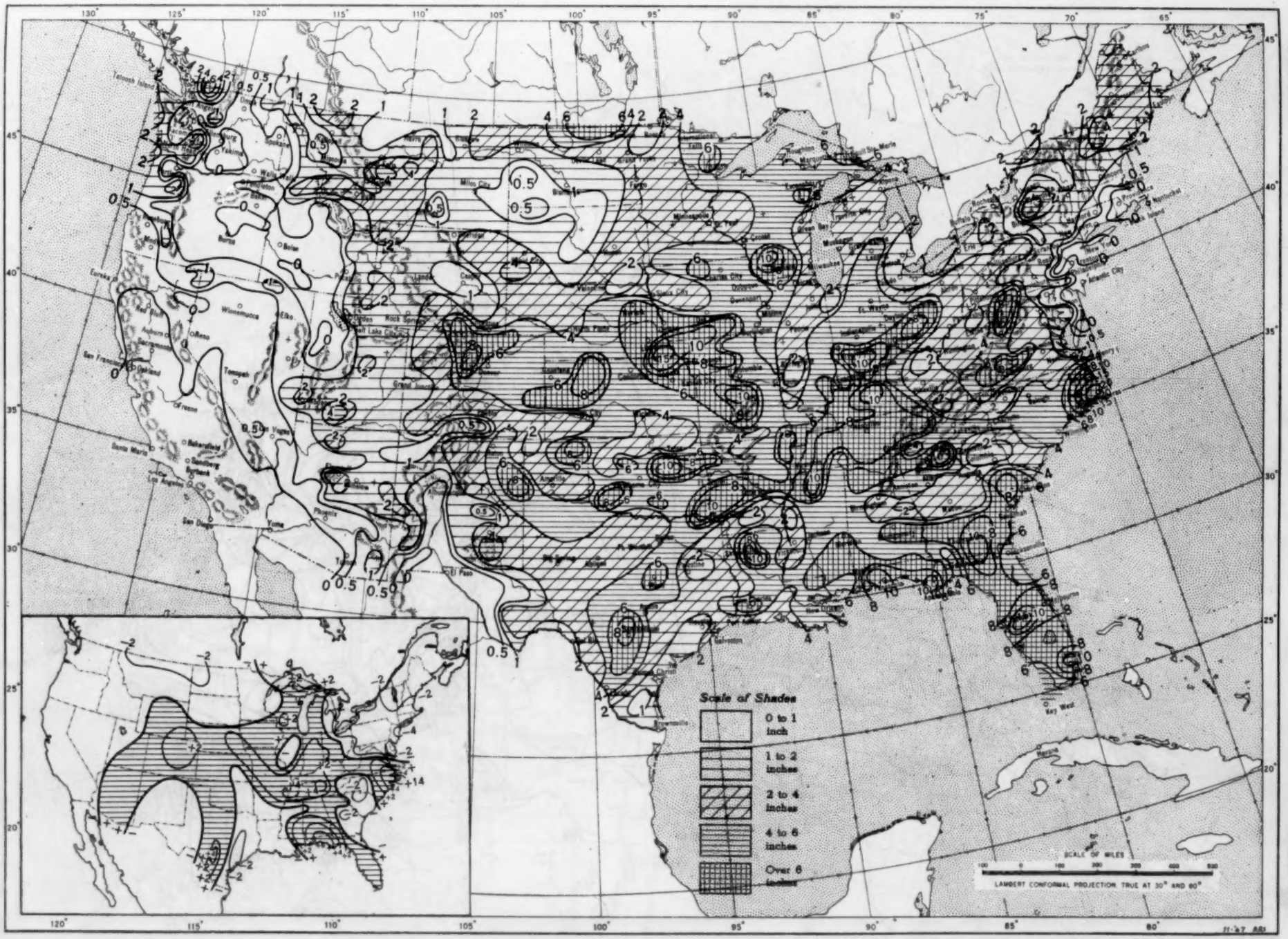

Scale of Shades
0 to 1 inch
1 to 2 inches
2 to 4 inches
4 to 6 inches
Over 6 inches
SCALE OF MILES
LAMBERT CONFORMAL PROJECTION TRUE AT 30° AND 60°

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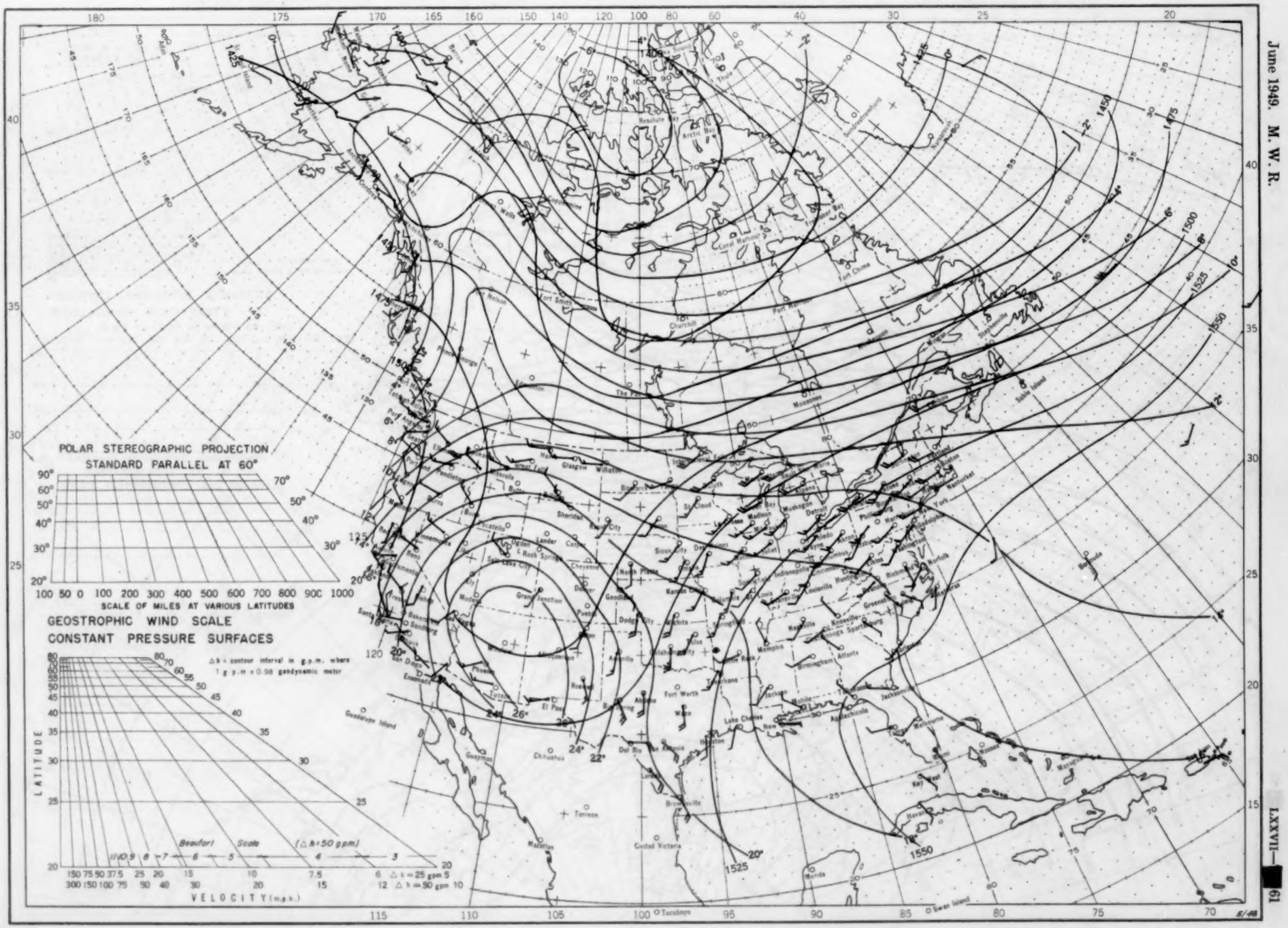
Chart VI. Isobars (mb.) at Sea Level and Isotherms (°F.) at Surface; June 1949

Chart VIII, June 1949. Contour Lines of Dynamic Height (Geopotential) in Units of 0.98 Dynamic Meters and Isotherms in

Chart VIII, June 1949. Contour Lines of Dynamic Height (Geopotential) in Units of 0.98 Dynamic Meters and Isotherms in Degrees Centigrade for the 850-millibar Pressure Surface, and Resultant Winds at 1,500 Meters (m. s. l.)



Contour lines and isotherms based on radiosonde observations at 0300 G. C. T. Winds indicated by black arrows based on pilot balloon observations at 2200 G. C. T.; those indicated by red arrows based on rawins taken at 0300 G. C. T.

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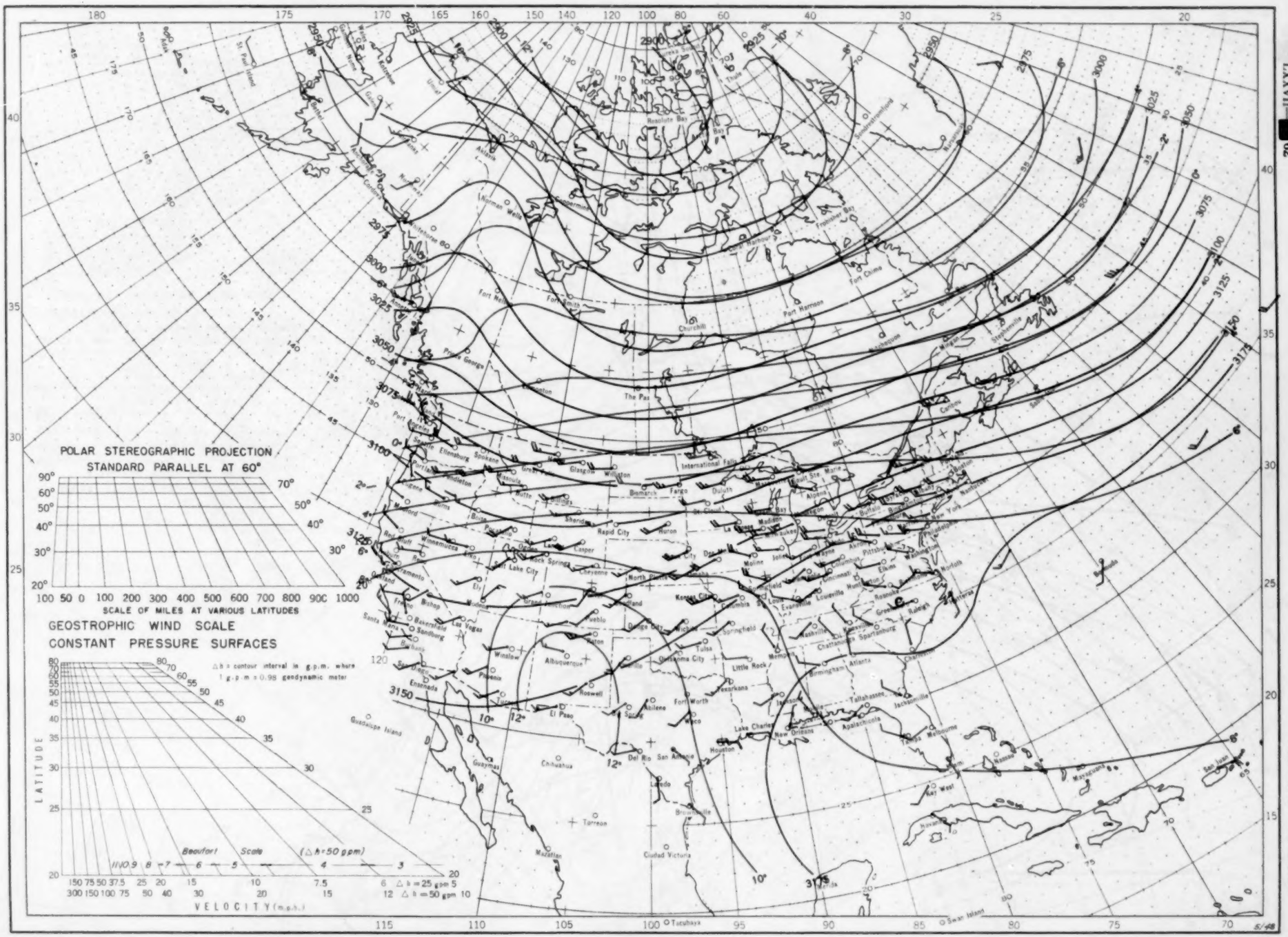
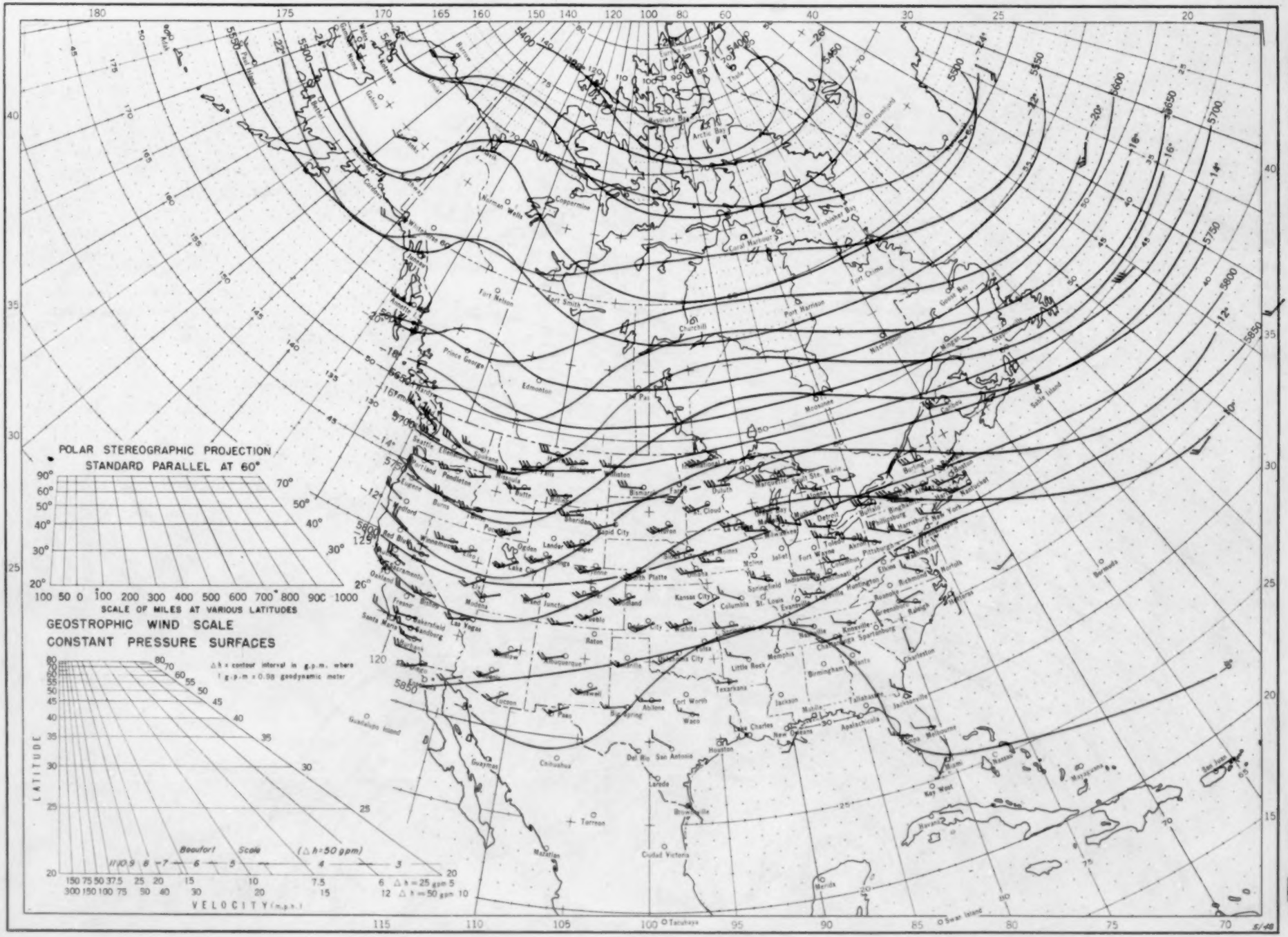
Chart IX, June 1949. Contour Lines of Dynamic Height (Geopotential) in Units of 0.98 Dynamic Meters and Isotherms in Degrees Centigrade for the 700-millibar Pressure Surface, and Resultant Winds at 3,000 Meters (m. s. l.)



Contour lines and isotherms based on radiosonde observations at 0300 G. C. T. Winds indicated by black arrows based on pilot balloon observations at 2200 G. C. T.; those indicated by red arrows based on rawins taken at 0300 G. C. T.

Contour lines and isotherms based on radiosonde observations at 0300 G. C. T. Winds indicated by black arrows based on pilot balloon observations at 2200 G. C. T.; those indicated by red arrows based on rawins taken at 0300 G. C. T.

Chart X, June 1949. Contour Lines of Dynamic Height (Geopotential) in Units of 0.98 Dynamic Meters and Isotherms in Degrees Centigrade for the 500-millibar Pressure Surface, and Resultant Winds at 5,000 Meters (m. s. l.)



Contour lines and isotherms based on radiosonde observations at 0300 G. C. T. Winds indicated by black arrows based on pilot balloon observations at 2200 G. C. T.; those indicated by red arrows based on rawins taken at 0300 G. C. T.

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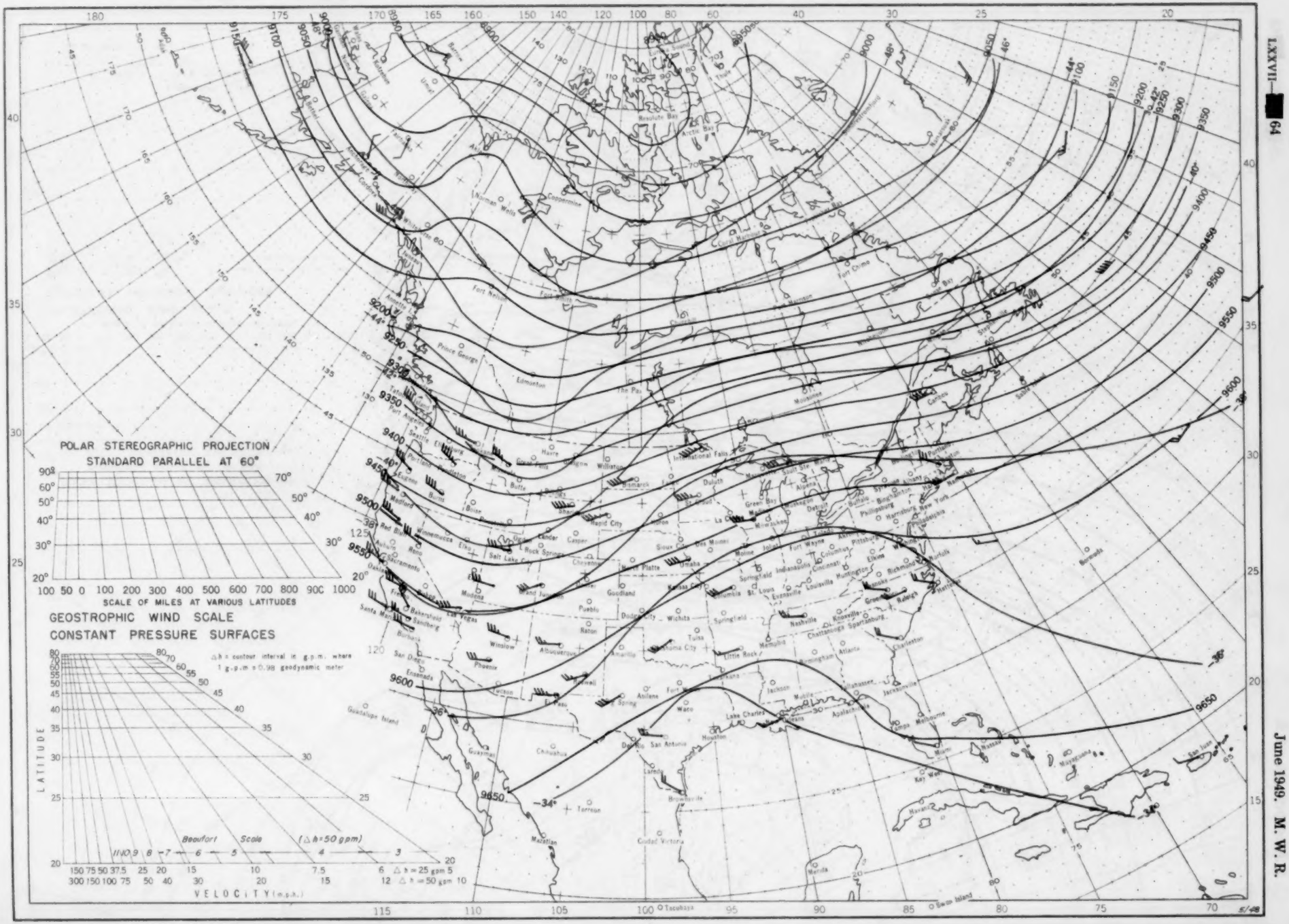
Chart XI, June 1949. Contour Lines of Dynamic Height (Geopotential) in Units of 0.98 Dynamic Meters and Isotherms in Degrees Centigrade for the 300-millibar Pressure Surface, and Resultant Winds at 10,000 Meters (m. s. l.)



Contour lines and isotherms based on radiosonde observations at 0300 G. C. T. Winds indicated by black arrows based on pilot balloon observations at 2200 G. C. T.; those indicated by red arrows based on rawins taken at 0300 G. C. T.